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MINERALS YEARBOOK

Area Reports: Domestic 2006

Volume II

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U.S. GEOLOGICAL SURVEY
Marcia K. McNutt, Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 2006 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 180 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Marcia K. McNutt, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at http://www.usgs.gov/ or by contacting the Earth Science Information Center at 1–888–ASK–USGS. For specific information about this publication, contact the Acting Chief, Minerals and Materials Analysis Section, via the Section Secretary, at (703) 648-7734. Additional minerals information may be accessed on the World Wide Web at http://minerals.usgs.gov/minerals/.

Acknowledgments

This volume was produced by Arnold O. Tanner and Gerald R. Smith, Physical Scientists, and Florence C. Katrivanos, Geologist, with the Minerals Information Team of the U.S. Geological Survey (USGS). Domestic nonfuel mineral production data and tables were prepared by Joseph M. Krisanda, Industry Data Analyst; crushed stone data and tables were prepared by Susan M. Weaver, Statistical Assistant; and construction sand and gravel data and tables were prepared by Cheryl J. Crawford, Statistical Assistant. All mineral commodity rankings and statistical analyses were performed by Mr. Tanner and were based upon data reported to the USGS by companies responding to the annual canvasses of nonfuel mineral producers in the United States. For crushed stone and construction sand and gravel, each State chapter includes tabular 2005–06 data in more detail (kind of stone, use, by aggregate district, and so forth), where applicable. The State maps, placed opposite the first page of the appropriate State chapter, were extensively updated and revised by Robert M. Callaghan, Physical Scientist, in collaboration with USGS mineral commodity specialists, State Geological Surveys, State minerals information agencies, and various other Federal Government agencies.

Compilations of data contained in this volume were largely based on statistics and other data provided by the mineral industries. The USGS gratefully acknowledges the willing contribution of these essential data by both companies and individuals. Information regarding a State's mining industry, mineral exploration, and other mining-related activities or legislation was derived from information submitted by officials from participating States. Authors of text submissions from participating States are referenced by a footnote in each chapter, as appropriate. We thank those State agencies that contributed mining and minerals industry information for their States. Their submissions significantly broadened the scope of those chapters; their participation in this joint project is greatly appreciated.

All chapters underwent technical review by USGS mineral commodity specialists and other agency professionals. The melding of their knowledge and expertise into this project was invaluable in producing accurate State reports and tables and is also greatly appreciated. State maps indicating "major producing areas" lead off each respective chapter; a Map Mineral Symbols chapter is included that lists in one place all of the mineral symbols used in these maps.

In the collection of statistical and other mineral industry information, the USGS also was assisted by various State agencies through cooperative memoranda of understanding (MOUs). Some of the chapters in this publication were reviewed by staff members of these State agencies. Our sincere appreciation for all agency cooperation is extended to each State and Commonwealth government agency that has an MOU with the USGS. These are as follows:

Alabama: Geological Survey of Alabama.
Arizona: Arizona Department of Mines and Mineral Resources.
Arkansas: Arkansas Geological Survey.
California: California Geological Survey.
Colorado: Colorado Geological Survey.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Hawaii: Hawaii Department of Land and Natural Resources, Commission on Water Resource Management.
Idaho: Idaho Geological Survey.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Geological Survey.
Iowa: Iowa Geological Survey and Land Quality Bureau.
Kansas: Kansas Geological Survey.
Kentucky: Kentucky Geological Survey.
Maine: Maine Geological Survey.
Maryland: Maryland Department of the Environment, Minerals, Oil, and Gas Division.
Massachusetts: Office of the Massachusetts State Geologist, University of Massachusetts.
Michigan: Michigan Department of Environmental Quality, Office of Geological Survey.
Mississippi: Mississippi Department of Environmental Quality, Office of Geology.
Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey.
Montana: Montana Bureau of Mines and Geology.
Nebraska: University of Nebraska-Lincoln, Nebraska Conservation and Survey Division.
Nevada: Nevada Bureau of Mines and Geology.
New Hampshire: New Hampshire Geological Survey.
New Jersey: New Jersey Geological Survey.
New Mexico: New Mexico Bureau of Geology and Mineral Resources.
New York: New York State Geological Survey.

North Carolina: North Carolina Geological Survey.
North Dakota: North Dakota Geological Survey.
Ohio: Ohio Department of Natural Resources, Division of Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey.
Puerto Rico: Puerto Rico Department of Natural and Environmental Resources, Division of Geology.
South Carolina: South Carolina Geological Survey.
South Dakota: South Dakota Geological Survey.
Tennessee: Tennessee Department of Environment and Conservation, Division of Geology.
Texas: The University of Texas at Austin, Bureau of Economic Geology.
Utah: Utah Geological Survey.
Vermont: Vermont Geological Survey.
Virginia: Virginia Department of Mines, Minerals and Energy, Division of Geology and Mineral Resources.
Washington: Washington State Department of Natural Resources, Division of Geology and Earth Resources.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological and Natural History Survey.
Wyoming: Wyoming State Geological Survey.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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Survey Methods for Nonfuel Minerals

By Jeffrey P. Busse

The U.S. Geological Survey (USGS) collects worldwide data on virtually every commercially important nonfuel mineral commodity. These data form the basis for tracking and assessing the health of the minerals sector of the U.S. economy.

The USGS data collection activity was instituted by the 47th Congress in the appropriations act of August 7, 1882 (22 Stat. 329), which placed the collection of mineral statistics on an annual basis. The most recent authority for the USGS survey activity is the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96–479, 94 Stat. 2305). The Act included provisions to strengthen protection for proprietary data provided to the U.S. Department of the Interior by persons or firms engaged in any phase of mineral or mineral-material production or consumption.

Data Collection Surveys

The USGS begins the collection of domestic nonfuel minerals and materials statistics by appraising the information requirements of Government and private organizations of the United States. Requirements that can be met by collecting data from minerals establishments are posed as questions on USGS surveys. Figure 1 shows a typical survey form.

Specific questions about mineral commodity activities, such as production, consumption, and shipments, are structured in the survey forms to provide meaningful aggregated data. Thus, the entire mineral economic cycle from production through consumption is covered by 140 monthly, quarterly, semiannual, and annual surveys.

After the survey form has been designed, a list of the appropriate establishments to be canvassed is developed. Many sources are used to determine which companies, mines, plants, and other operations are expected to be included on the survey mailing list. State geologists, Federal organizations (such as the Mine Safety and Health Administration), trade associations, industry representatives, and trade publications and directories are some of the sources that are used to develop and update survey listings. With few exceptions, a complete canvass of the list of establishments is used rather than a sample survey. The iron and steel scrap and pig iron canvass is one of the exceptions where a sample survey is conducted.

The Paperwork Reduction Act requires that any Government agency that wants to collect information from 10 or more individuals or establishments must first obtain approval from the Office of Management and Budget (OMB), which approves the need to collect the data and protects industry from unwarranted Government paperwork. This approval is indicated by the OMB Control Number on the survey forms (figure 1).

Survey Processing

The USGS surveys approximately 20,000 establishments. Each year, the USGS mails about 35,000 forms for 140 different surveys. Each completed survey form returned to the USGS undergoes extensive analysis, including computerized checks, to ensure the highest possible accuracy of the mineral data. The statistical staff monitor all surveys to ensure that errors are not created by reporting in physical units different from the units requested on the form. Relations between associated measures, such as produced crude ore and marketable crude ore, are analyzed for consistency. Engineering variables, such as recovery factors from ores and concentrates, also are used. The totals for each form are verified, and currently reported data are checked against prior reports to detect possible errors or omissions.

The USGS is also developing an Internet-based electronic forms system as required by the Government Paperwork Elimination Act (GPEA). This electronic system is designed to speed the collection and analysis of minerals information. As of December 2006, 54 canvass forms, accounting for 89% of annual responses covered by GPEA, are available electronically.

Survey Responses.—To enable the reader to better understand the basis on which the statistics are calculated, each mineral commodity chapter includes a section about domestic data coverage. This section briefly describes the data sources, the number of establishments surveyed, the response percentage, and the method of estimating the production or consumption for nonrespondents.

To produce reliable aggregated data, the USGS uses efficient procedures for handling instances of nonresponse. Failure to respond to the initial survey form results in a second request, either a second mailing of the paper form or an e-mail in the case of electronic respondents. If the second request does not produce a response, then telephone calls are made to the nonrespondents. The followup calls provide the necessary data to complete the survey forms and/or to verify questionable data entries. Periodic visits to mineral establishments also are made by USGS mineral commodity specialists to gather missing data and to explain the importance of the establishment's reporting. By describing the use of the published statistics and showing the impact of nonresponse, the USGS strives to encourage respondents to give complete and accurate replies.

The OMB publication "Guidelines for Reducing Reporting Burden" stipulates that the minimum acceptable response rate is 75% of the panel surveyed. In addition, the USGS strives for a minimum reporting level of 75% of the quantity produced or consumed (depending on the survey) for certain key statistics. Response rates are periodically reviewed. For those surveys that do not meet the minimum reporting level, procedures are developed and implemented to improve response rates.

Estimation for Nonresponse.—When efforts to obtain a response to a survey fail, estimation or imputation techniques must be used to account for missing data. Some of the estimation methods depend on knowledge of prior establishment reporting; other techniques rely on external information to estimate the missing data. When survey forms are received after the current publication has been completed, the forms are reviewed, necessary imputations are made for missing data, and the survey database is updated. The revised data are reported in later publications.

Protection of Proprietary Data.—The USGS relies on the cooperation of the U.S. minerals industry to provide the mineral data that are presented in this and other USGS minerals information publications. Without a strong response to survey requests, the USGS would not be able to present reliable statistics. The USGS, in turn, respects the proprietary nature of the data received from the individual companies and establishments. To ensure that proprietary rights will not be violated, the USGS analyzes each of the aggregated statistics to determine if the data reported by an individual establishment can be deduced from the aggregated statistics. If, for example, there are only two significant producers of a mineral commodity in a given State, then the USGS will not publish the State total because either producer could readily estimate the production of the other. It is this obligation to protect proprietary information that results in the withheld, or W, entries in the published tables. If a company gives permission in writing, however, then the USGS will publish the data as long as the data from other respondents are protected from disclosure.

International Data

International data are collected by USGS country specialists and international data coordinators. The data are gathered from various sources, which include published reports of foreign Government mineral and statistical agencies, international organizations, the U.S. Department of State, the United Nations, the Organization of the Petroleum Exporting Countries, and personal contact by specialists traveling abroad. Each February, minerals questionnaires are sent to foreign organizations requesting estimates of mineral production for the country for the preceding year. Missing data are estimated by USGS country specialists on the basis of historical trends and the specialist's knowledge of current production capabilities in each country.

Publications

The USGS disseminates current and historical minerals information through printed publications and its Web site.

Printed Publications.—The Minerals Yearbook summarizes annually, on a calendar-year basis, the significant economic and technical developments in the mineral industries. Three volumes are issued each year—volume I, Metals and Minerals; volume II, Area Reports: Domestic; and volume III, Area Reports: International. Volume I presents, by mineral commodity, salient statistics on production, trade, consumption, and other measures of economic activity. Volume II reviews the U.S. minerals industry by State and island possessions. Volume III is published as four separate regional reports that cover more than 175 foreign countries. These reports contain individual country chapters that examine the mining, refining, processing, and use of minerals in each country in the region and how they relate to U.S. industry. Volume III chapters also contain information on energy minerals.

The Mineral Commodity Summaries (MCS), which is an up-to-date summary of about 80 nonfuel mineral commodities, is the earliest Government publication to furnish estimates that cover the previous year's nonfuel mineral industry data. It contains information on the domestic industry structure, Government programs, tariffs, 5-year salient domestic statistics, and a summary of significant events, trends, and issues in the domestic and international minerals industry during the past year.

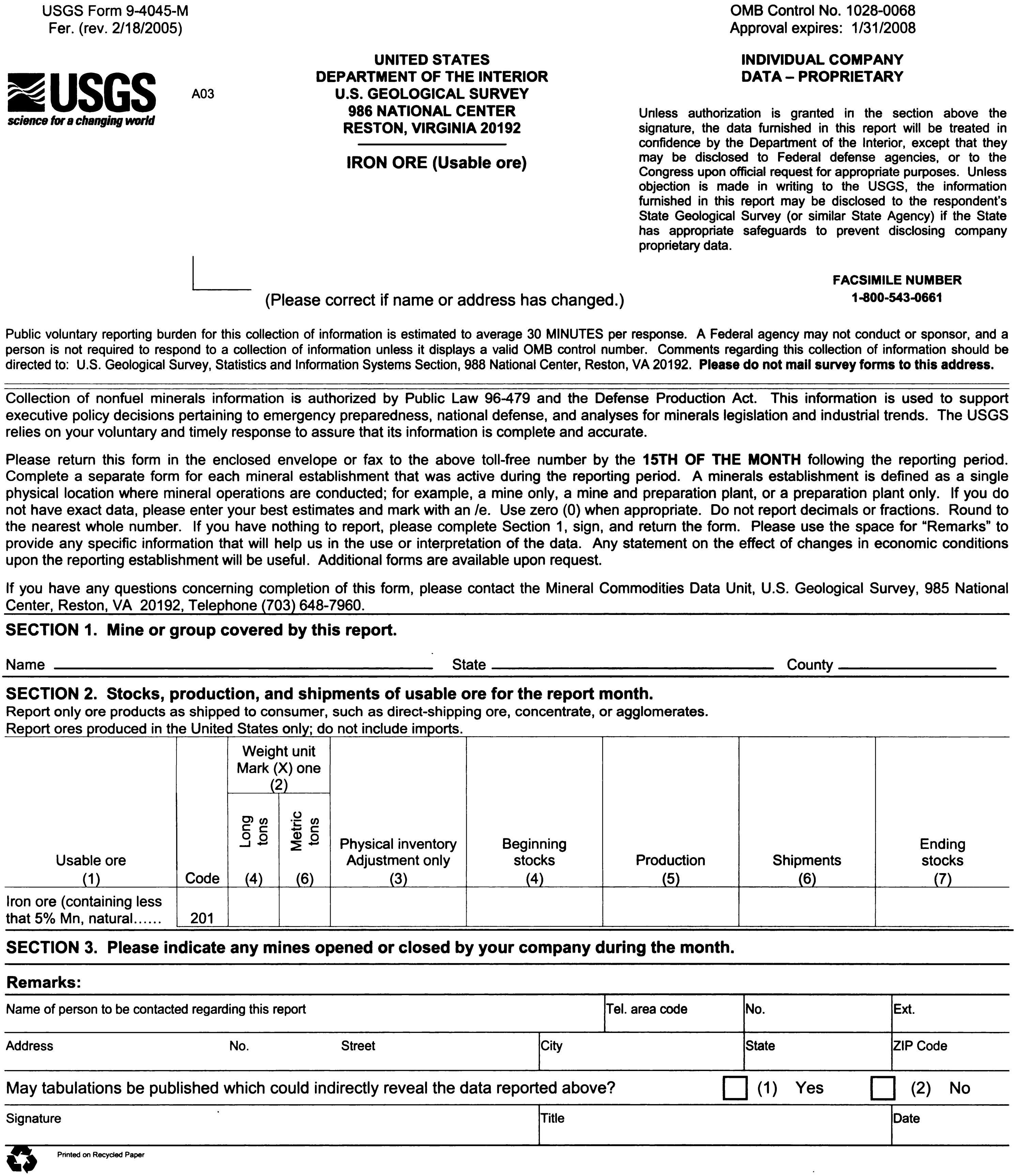
The Minerals Yearbook and the MCS may be purchased from the U.S. Government Printing Office, Superintendent of Documents, P.O. Box 979050, St. Louis, MO 63197-9000; telephone, (202) 512–1800 or (866) 512–1800 (toll-free); World Wide Web at URL, http://bookstore.gpo.gov.

Electronic Publications.—Current and historical minerals information is available through the USGS Web site at URL http://minerals.usgs.gov/minerals. The Web site provides USGS minerals information products to view or download, as well as USGS contacts for minerals information and links to other mineral-related sites on the Internet.

Mineral Industry Surveys (MIS) contain timely statistical and economic data on minerals. The surveys are designed to keep Government agencies and the public, particularly the mineral industry and the business community, informed of trends in the production, distribution, inventories, and consumption of minerals. Frequency of issue depends on the demand for current data. MIS are released monthly, quarterly, or annually.

Metal Industry Indicators, which is published monthly, contains indexes that measure the current and future performance of three U.S. metal industries. For each of the three industries, a composite coincident index and a composite leading index have been developed based on procedures and data similar to those used to construct the Conference Board's coincident and leading cyclical indexes for the national economy. Nonmetallic Mineral Products Industry Indexes, also published monthly, contains leading and coincident indexes which measure the current and future performance of the industrial minerals industry. The indexes were designed by using the same procedures as the USGS metal composite indexes.

FIGURE 1
A TYPICAL SURVEY FORM



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A03

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Collection of nonfuel minerals information is authorized by Public Law 96-479 and the Defense Production Act. This information is used to support executive policy decisions pertaining to emergency preparedness, national defense, and analyses for minerals legislation and industrial trends. The USGS relies on your voluntary and timely response to assure that its information is complete and accurate.

Please return this form in the enclosed envelope or fax to the above toll-free number by the **15TH OF THE MONTH** following the reporting period. Complete a separate form for each mineral establishment that was active during the reporting period. A minerals establishment is defined as a single physical location where mineral operations are conducted; for example, a mine only, a mine and preparation plant, or a preparation plant only. If you do not have exact data, please enter your best estimates and mark with an /e. Use zero (0) when appropriate. Do not report decimals or fractions. Round to the nearest whole number. If you have nothing to report, please complete Section 1, sign, and return the form. Please use the space for "Remarks" to provide any specific information that will help us in the use or interpretation of the data. Any statement on the effect of changes in economic conditions upon the reporting establishment will be useful. Additional forms are available upon request.

If you have any questions concerning completion of this form, please contact the Mineral Commodities Data Unit, U.S. Geological Survey, 985 National Center, Reston, VA 20192, Telephone (703) 648-7960.

SECTION 1. Mine or group covered by this report.

Name ____ State ____ County ____

SECTION 2. Stocks, production, and shipments of usable ore for the report month.
Report only ore products as shipped to consumer, such as direct-shipping ore, concentrate, or agglomerates.
Report ores produced in the United States only; do not include imports.

Usable ore (1)	Code	Weight unit Mark (X) one (2)		Physical inventory Adjustment only (3)	Beginning stocks (4)	Production (5)	Shipments (6)	Ending stocks (7)
		Long tons (4)	Metric tons (6)					
Iron ore (containing less that 5% Mn, natural......	201							

SECTION 3. Please indicate any mines opened or closed by your company during the month.

Remarks:

Name of person to be contacted regarding this report | Tel. area code | No. | Ext.

Address No. Street | City | State | ZIP Code

May tabulations be published which could indirectly reveal the data reported above? ☐ (1) Yes ☐ (2) No

Signature | Title | Date

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STATISTICAL SUMMARY

By Joseph M. Krisanda

The world production table was prepared by Glenn J. Wallace, international data corrdinator.

This annual report summarizes data on crude nonfuel mineral production[1] for the United States, its island possessions, and the Commonwealth of Puerto Rico.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this annual report is what is termed "mine output." This term refers to minerals or ores in the form in which they are first extracted from the ground, but customarily may include the output from auxiliary processing at or near the mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. For copper, gold, lead, silver, and zinc, the quantities listed are recorded on a mine basis (as the recoverable content of ore sold or treated). The values assigned to the quantities, however, are based on the average selling price of refined metal, not the mine value.

The total value of all nonfuel mineral production in the United States in 2006 increased to $66.5 billion, which was an increase of more than 20% compared with that of 2005; metals increased to $23.3 billion, which was an increase of more than 41%; and industrial minerals increased to $43.2 billion, more than 11%.

In 2006, the value of nonfuel mineral commodity production for the following 11 commodities, in descending order of production value, was greater than $1 billion: stone (crushed), cement (portland), sand and gravel (construction), copper, gold, molybdenum concentrates, iron ore (usable shipped), zinc, lime, salt, soda ash. They accounted for more than 86% of the U.S. total production value (table 1).

In 2006, the value of nonfuel mineral commodity production in the following 22 States, in descending order of production value, was greater than $1 billion: Arizona, Nevada, California, Utah, Florida, Alaska, Texas, Minnesota, Georgia, Missouri, Michigan, Pennsylvania, Colorado, Wyoming, New Mexico, Alabama, New York, Virginia, Ohio, Illinois, Montana, and North Carolina. They accounted for more than 80% of the U.S. total production value (table 3).

---

[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 U.S. Geological Survey (USGS) mineral production data published in this chapter are as of July 2009. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information are available on the Internet at http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—are also available on the Internet at http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Metals:							
Beryllium concentrates	metric tons	2,210	NA	2,780	NA	3,830	NA
Copper[3]		1,160	3,420,000	1,140	4,360,000	1,200	8,310,000
Gold[3]	kilograms	258,000	3,400,000	256,000	3,670,000	252,000	4,910,000
Iron ore, usable shipped		54,900	2,080,000	53,200	2,370,000	52,700	2,840,000
Lead[3]	metric tons	430,000	523,000	426,000	574,000	419,000	715,000
Mercury[4]		NA	NA	NA	NA	NA	NA
Molybdenum concentrates[5, 6]	metric tons	42,000	1,420,000	58,000	3,660,000	59,900	3,040,000
Palladium[3]	kilograms	13,700	102,000	13,300	87,100	14,400	150,000
Platinum[3]	do.	4,040	110,000	3,920	113,000	4,290	158,000
Silver[3]	do.	1,250,000	268,000	1,230,000	289,000	1,140,000	425,000
Zinc[3]	metric tons	715,000	827,000	720,000	1,070,000	699,000	2,450,000
Combined values of cadmium (byproduct in zinc concentrates),[7] iron oxide pigments (crude), magnesium metal, titanium concentrates, zirconium concentrates		XX	304,000	XX	317,000 [r]	XX	289,000
Total		XX	12,500,000	XX	16,500,000	XX	23,300,000
Industrial minerals, excluding fuels:[8]							
Barite		532	18,700	489	17,600	589	23,500
Boron		1,210	626,000	1,150	713,000	(9)	W
Bromine	metric tons	222,000	191,000	226,000	168,000	243,000	339,000
Cement:[10]							
Masonry		5,000	585,000 [e]	5,420	679,000 [e]	5,400	743,000 [e]
Portland		92,400	7,110,000 [e]	93,900	8,360,000 [e]	92,800	9,230,000 [e]
Clays:							
Ball		1,220	54,100	1,210	52,900	1,190	53,400
Bentonite		4,060	179,000	4,710	215,000	4,940	234,000
Common		24,600	174,000 [r]	24,300	176,000	24,200	243,000
Fire		256	7,870	353	10,700	848	19,000
Fuller's earth		3,260	329,000	2,730 [r]	275,000 [r]	2,540	243,000
Kaolin		7,760	945,000	7,800	860,000	7,470	980,000
Diatomite		620	177,000	653	179,000	799	176,000
Feldspar[10]		770	44,200	750	43,000	760	44,600
Garnet, industrial[10]	metric tons	28,400	3,050	40,100 [r]	3,840	34,100	4,230
Gemstones, natural[10]		NA	14,500	NA	13,400	NA	11,300
Gypsum, crude[10]		17,200	124,000	21,100	158,000	21,100	192,000
Helium:							
Crude	million cubic meters	57	77,500	42	63,300	41	66,000
Grade-A	do.	130	299,000	133	336,000	139	395,000
Iodine[10]	metric tons	1,130	W	1,570	W	(9)	W
Kyanite[e]		90	13,400	90	13,400	90	14,000
Lime		20,000	1,370,000	20,000	1,500,000	21,000	1,700,000
Mica, crude	metric tons	99,200	15,400	78,100	19,300 [r]	110,000	22,400
Peat[11]		741	21,200	751	20,800	734	20,100
Perlite, crude	metric tons	508,000	20,600	508,000	20,700	454,000	19,500
Phosphate rock, marketable[10]		35,800	995,000	36,100	1,070,000	30,100	919,000
Potash, gross weight		2,700	340,000	2,500	410,000	2,400	410,000
Pumice and pumicite	metric tons	1,490,000	25,000	1,270,000	39,300	1,540,000	44,300
Salt		45,000	1,270,000	45,000	1,310,000	44,300	1,370,000
Sand and gravel:							
Construction		1,240,000	6,590,000	1,280,000 [r]	7,500,000 [r]	1,320,000	8,540,000
Industrial		29,700	685,000	30,600	752,000	31,700	807,000
Silica stone[12]	metric tons	655	3,660	576	2,290	227	992
Soda ash[9]		11,000	770,000	11,000	968,000	11,000	1,170,000

See footnotes at end of table.

TABLE 1—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
Industrial minerals, excluding fuels—Continued:							
Stone, crushed[13]		1,630,000 r	9,890,000 r	1,700,000 r	12,400,000 r	1,720,000	13,800,000
Talc, crude[10]		833	23,200	856	24,400	895	27,400
Tripoli[9, 10]	metric tons	94,000	19,400	91,100	18,700	76,000	17,500
Vermiculite, concentrate[e]		100	W	100	W	100	W
Combined values of brucite, greensand marl, lithium carbonate, magnesite, magnesium compounds, olivine, pyrophyllite (crude), staurolite, stone (dimension), wollastonite, zeolites, and values indicated by symbol W		XX	507,000 r	XX	531,000 r	XX	1,280,000
Total		XX	33,500,000 r	XX	38,900,000 r	XX	43,200,000
Grand total		XX	46,000,000 r	XX	55,400,000 r	XX	66,500,000

[e] Estimated. [r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value." XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Recoverable content of ores, etc.

[4] Secondary production.

[5] Content of ore and concentrate.

[6] Shipments.

[7] Data not available for 2006.

[8] Sold or used unless otherwise specified.

[9] Withheld to avoid disclosing company proprietary data.

[10] Production.

[11] Excludes attapulgite.

[12] Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[13] Excludes abrasive stone and bituminous limestone and sandstone; all included elsewhere in table.

TABLE 2
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2006

(Principal States based on quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Barite	NV and GA	
Beryllium concentrates	UT	
Boron	CA	
Bromine	AR and MI	
Brucite	TX	
Cement:		
Masonry	FL, CA, SC, AL, IN	AR, AZ, CO, GA, IA, KS, KY, MD, ME, MI, MO, MT, NE, NM, NY, OH, OK, PA, TN, TX, VA, WV.
Portland	TX, CA, PA, FL, MI	All other States, except AK, CT, DE, HI, LA, MA, MN, NC, ND, NH, NJ, RI, VT, WI.
Clays:		
Ball	TN, TX, MS, KY, IN	
Bentonite	WY, MT, AL, MS, UT	AZ, CA, CO, NV, OR, TX.
Common	TX, NC, AL, OH, GA	All other States, except AK, DE, HI, ID, NH, NV, RI, VT, WI.
Fire	MO, CA, OH, SC, AL	WA.
Fuller's earth	GA, MO, MS, VA, FL	CA, IL, KS, NV, TN, TX.
Kaolin	GA, SC, AR, AL, CA	FL, NC, NV, TN, TX.
Copper[1]	AZ, UT, NM, NV, MT	ID and MO.
Diatomite	CA, NV, OR, WA	
Feldspar	NC, VA, CA, OK, GA	ID and SD.
Garnet, industrial	NY, ID, MT	
Gemstones, natural[2]	TN, OR, AZ, CA, AR	All other States.
Gold[1]	NV, UT, AK, CO, MT	AZ, CA, ID, NM, SD.
Greensand marl	NJ	
Gypsum, crude	OK, IA, NV, CA, AR	AZ, CO, IN, KS, LA, MI, NM, NY, SD, TX, UT, WY.
Helium:		
Crude	KS and TX	
Grade–A	KS, WY, TX, OK, CO	NM and UT.
Iodine, crude	OK	
Iron ore, usable	MN, MI, SD, CA	
Iron oxide pigments, crude	GA, AL, VA	
Kyanite	VA	
Lead[1]	MO, AK, ID, WA, MT	
Lime	MO, AL, KY, OH, TX	All other States, except AK, CT, DE, HI, KS, MD, ME, MS, NC, NH, NJ, NY, RI, SC, VT.
Lithium carbonate	NV	
Magnesite	NV	
Magnesium compounds	MI, UT, FL, DE, CA	
Magnesium metal	UT	
Mica, crude	NC, SD, AL, SC, GA	
Molybdenum, concentrates	UT, CO, AZ, ID, MT	NM and NV.
Olivine	WA	
Palladium[1]	MT	
Peat	FL, MN, NY, IL, MI	IA, IN, ME, NJ, OH, PA, WA, WI, WV.
Perlite, crude	NM, OR, AZ, UT, CA	ID and NV.
Phosphate rock	FL, NC, ID, UT	
Platinum[1]	MT	
Potash	NM, UT, MI	
Pumice and pumicite	AZ, OR, CA, ID, NM	KS and NV.
Pyrophyllite, crude	NC	
Salt	LA, TX, NY, OH, UT	AL, AZ, CA, KS, MI, NM, NV, OK, TN, WV.
Sand and gravel:		
Construction	CA, TX, AZ, MI, MN	All other States.
Industrial	IL, FL, WI, CA, OK	All other States, except AK, CT, DE, HI, KY, MA, MD, ME, MT, NE, NH, OR, SD, UT, VT, WY.
Silica stone[3]	AR	
Silver[1]	AK, NV, ID, UT, MT	AZ, CA, CO, MO, NM.
Soda ash	WY and CA	
Staurolite	FL	
Stone:		
Crushed	TX, FL, PA, GA, MO	All other States.
Dimension	WI, IN, VT, MA, GA	All other States, except AK, DE, FL, HI, IA, IL, KY, LA, MS, ND, NE, NJ, NV, OR, RI, WY.

See footnotes at end of table.

TABLE 2—Continued
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2006

(Principal States based upon quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Talc, crude	MT, TX, VT, NY, CA	OR and VA.
Titanium concentrates:		
Ilmenite	VA, FL	
Rutile	FL	
Tripoli	IL, OK, AR, PA	
Vermiculite, crude	SC and VA	
Wollastonite	NY	
Zeolites	NM, TX, ID, AZ, NV	CA and WY.
Zinc[1]	AK, MO, WA, NY, MT	ID.
Zirconium concentrates	FL, VA, GA	

[1] Content of ores, etc.

[2] Principal producing States based on value.

[3] Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 3

VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 2006[1]

State	Value (thousands)	Rank	Percentage of U.S. total	Principal minerals, in order of value
Alabama	$1,360,000	16	2.04	Cement (portland), stone (crushed), lime, sand and gravel (construction), cement (masonry).
Alaska	3,010,000	6	4.53	Zinc, gold, lead, silver, sand and gravel (construction).
Arizona	6,740,000	1	10.13	Copper, molybdenum concentrates, sand and gravel (construction), cement (portland), stone (crushed).
Arkansas	789,000	28	1.19	Bromine, stone (crushed), cement (portland), sand and gravel (construction), lime.
California	4,590,000	3	6.91	Sand and gravel (construction), cement (portland), boron minerals, stone (crushed), soda ash.
Colorado	1,680,000	13	2.52	Molybdenum concentrates, sand and gravel (construction), cement (portland), gold, stone (crushed).
Connecticut[2]	168,000	42	0.25	Stone (crushed), sand and gravel (construction), stone (dimension), clays (common), gemstones (natural).
Delaware[2]	22,400	50	0.03	Sand and gravel (construction), magnesium compounds, stone (crushed), gemstones (natural).
Florida	3,220,000	5	4.85	Stone (crushed), phosphate rock, cement (portland), sand and gravel (construction), cement (masonry).
Georgia	2,080,000	9	3.13	Clays (kaolin), stone (crushed), cement (portland), sand and gravel (construction), clays (fuller's earth).
Hawaii	145,000	44	0.22	Stone (crushed), sand and gravel (construction), gemstones (natural).
Idaho	797,000	27	1.20	Molybdenum (concentrates), sand and gravel (construction), phosphate rock, silver, stone (crushed).
Illinois	1,220,000	20	1.84	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), lime.
Indiana	982,000	23	1.48	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Iowa	696,000	31	1.05	Stone (crushed), cement (portland), sand and gravel (construction), gypsum (crude), lime.
Kansas	973,000	24	1.46	Cement (portland), helium (Grade–A), stone (crushed), salt, sand and gravel (construction).
Kentucky	806,000	26	1.21	Stone (crushed), lime, cement (portland), sand and gravel (construction), clays (common).
Louisiana	481,000	37	0.72	Sand and gravel (construction), salt, stone (crushed), clays (common), sand and gravel (industrial).
Maine	158,000	43	0.24	Sand and gravel (construction), cement (portland), stone (crushed), stone (dimension), cement (masonry).
Maryland[2]	653,000	33	0.98	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), stone (dimension).
Massachusetts[2]	294,000	38	0.44	Stone (crushed), sand and gravel (construction), lime, stone (dimension), clays (common).
Michigan	1,930,000	11	2.90	Iron ore (usable shipped), cement (portland), sand and gravel (construction), salt, stone (crushed).
Minnesota[2]	2,540,000	8	3.83	Iron ore (usable shipped), sand and gravel (construction), stone (crushed), sand and gravel (industrial), stone (dimension).
Mississippi	270,000	39	0.41	Sand and gravel (construction), stone (crushed), cement (portland), clays (fuller's earth), clays (ball).
Missouri	2,070,000	10	3.11	Stone (crushed), cement (portland), lead, lime, zinc.
Montana	1,070,000	21	1.60	Copper, molybdenum (concentrates), platinum metal, palladium metal, sand and gravel (construction).
Nebraska[2]	129,000	45	0.19	Cement (portland), stone (crushed), sand and gravel (construction), lime, cement (masonry).
Nevada	5,140,000	2	7.73	Gold, copper, sand and gravel (construction), silver, lime.
New Hampshire[2]	112,000	46	0.17	Sand and gravel (construction), stone (crushed), stone (dimension), gemstones (natural).
New Jersey[2]	547,000	35	0.82	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), greensand marl, peat.
New Mexico	1,470,000	15	2.22	Copper, potash, sand and gravel (construction), molybdenum (concentrates), cement (portland).
New York	1,330,000	17	2.00	Stone (crushed), cement (portland), salt, sand and gravel (construction), zinc.
North Carolina[2]	1,020,000	22	1.54	Stone (crushed), phosphate rock, sand and gravel (construction), sand and gravel (industrial), clays (common).
North Dakota[2]	44,400	48	0.07	Sand and gravel (construction), lime, stone (crushed), clays (common), sand and gravel (industrial).
Ohio	1,270,000	19	1.91	Stone (crushed), sand and gravel (construction), salt, lime, cement (portland).
Oklahoma	684,000	32	1.03	Stone (crushed), cement (portland), sand and gravel (construction), iodine, sand and gravel (industrial).
Oregon	509,000	36	0.77	Stone (crushed), sand and gravel (construction), cement (portland), diatomite, perlite (crude).
Pennsylvania[2]	1,710,000	12	2.58	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Rhode Island[2]	43,700	49	0.07	Sand and gravel (construction), stone (crushed), sand and gravel (industrial), gemstones (natural).
South Carolina	735,000	29	1.11	Cement (portland), stone (crushed), cement (masonry), sand and gravel (construction), sand and gravel (industrial).
South Dakota	223,000	41	0.34	Cement (portland), sand and gravel (construction), stone (crushed), stone (dimension), gold.
Tennessee	856,000	25	1.29	Stone (crushed), cement (portland), sand and gravel (construction), clays (ball), sand and gravel (industrial).
Texas	2,980,000	7	4.49	Cement (portland), stone (crushed), sand and gravel (construction), salt, lime.
Utah	3,960,000	4	5.96	Copper, molybdenum (concentrates), gold, sand and gravel (construction), cement (portland).
Vermont[2]	84,200	47	0.13	Stone (crushed), sand and gravel (construction), stone (dimension), talc (crude), gemstones (natural).
Virginia	1,270,000	18	1.92	Stone (crushed), cement (portland), sand and gravel (construction), lime, zirconium (concentrates).
Washington	718,000	30	1.08	Sand and gravel (construction), stone (crushed), zinc, cement (portland), lime.
West Virginia	230,000	40	0.35	Stone (crushed), cement (portland), lime, sand and gravel (industrial), cement (masonry).
Wisconsin[2]	566,000	34	0.85	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), lime, stone (dimension).
Wyoming	1,590,000	14	2.40	Soda ash, clays (bentonite), helium (Grade–A), sand and gravel (construction), stone (crushed).
Undistributed	502,000	XX	0.75	
Total	66,500,000	XX	100.00	

See footnotes of end at table.

XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown. Table includes data available through July 9, 2009.

[2] Partial total; excludes values that must be withheld to avoid disclosing company proprietary data which are included with "Undistributed."

[3] Revision to this data is to be published in the USGS Minerals Yearbook 2007—Total, 401,000.

TABLE 4

VALUE OF NONFUEL MINERAL PRODUCTION PER CAPITA AND PER SOUARE KILOMETER IN 2006 BY STATE[1]

State	Land area (square kilometers)	Population (thousands)	Total value (thousands)	Per capita		Per square kilometer	
				Dollars	Rank	Dollars	Rank
Alabama	131,000	4,600	$1,360,000	$295	13	$10,300	20
Alaska	1,480,000	670	3,010,000	4,490	1	2,030	46
Arizona	294,000	6,170	6,740,000	1,090	6	22,900	4
Arkansas	135,000	2,810	789,000	281	15	5,850	29
California	404,000	36,500	4,590,000	126	31	11,400	17
Colorado	269,000	4,750	1,680,000	353	11	6,240	28
Connecticut	12,500	3,510	168,000 [2]	48	47	13,400	11
Delaware	5,060	853	22,400 [2]	26	50	4,420	34
Florida	140,000	18,100	3,220,000	178	21	23,100	3
Georgia	150,000	9,360	2,080,000	222	17	13,900	10
Hawaii	16,600	1,290	145,000	113	35	8,710	22
Idaho	214,000	1,470	797,000	543	8	3,720	40
Illinois	144,000	12,800	1,220,000	95	40	8,500	23
Indiana	92,900	6,310	982,000	156	24	10,600	19
Iowa	145,000	2,980	696,000	234	16	4,810	31
Kansas	212,000	2,760	973,000	352	12	4,590	33
Kentucky	103,000	4,210	806,000	192	18	7,840	26
Louisiana	113,000	4,290	481,000	112	37	4,260	36
Maine	79,900	1,320	158,000	119	32	1,970	47
Maryland	25,300	5,620	653,000 [2]	116	33	25,800	2
Massachusetts	20,300	6,440	294,000 [2]	46	48	14,500	9
Michigan	147,000	10,100	1,930,000	191	20	13,100	12
Minnesota	206,000	5,170	2,540,000 [2]	492	9	12,300	14
Mississippi	121,000	2,910	270,000	93	41	2,220	44
Missouri	178,000	5,840	2,070,000	354	10	11,600	16
Montana	377,000	945	1,070,000	1,130	5	2,830	43
Nebraska	199,000	1,770	129,000 [2]	73	43	648	49
Nevada	284,000	2,500	5,140,000	2,060	3	18,100	6
New Hampshire	23,200	1,320	112,000 [2]	86	42	4,840	30
New Jersey	19,200	8,730	547,000 [2, 4]	63	46	28,500	1
New Mexico	314,000	1,960	1,470,000	754	7	4,690	32
New York	122,000	19,300	1,330,000	69	45	10,900	18
North Carolina	126,000	8,860	1,020,000 [2]	115	34	8,100	24
North Dakota	179,000	636	44,400 [2]	70	44	249	50
Ohio	106,000	11,500	1,270,000	111	38	12,000	15
Oklahoma	178,000	3,580	684,000	191	19	3,850	39
Oregon	249,000	3,700	509,000	137	27	2,050	45
Pennsylvania	116,000	12,400	1,710,000 [2]	138	26	14,800	8
Rhode Island	2,710	1,070	43,700 [2]	41	49	16,200	7
South Carolina	78,000	4,320	735,000	170	22	9,430	21
South Dakota	197,000	782	223,000	286	14	1,140	48
Tennessee	107,000	6,040	856,000	142	25	8,020	25
Texas	678,000	23,500	2,980,000	127	29	4,400	35
Utah	213,000	2,550	3,960,000	1,550	4	18,600	5
Vermont	24,000	624	84,200 [2]	135	28	3,520	42
Virginia	103,000	7,640	1,270,000	167	23	12,400	13
Washington	172,000	6,400	718,000	112	36	4,170	37
West Virginia	62,400	1,820	230,000	126	30	3,690	41
Wisconsin	141,000	5,560	566,000 [2]	102	39	4,030	38
Wyoming	251,000	515	1,590,000	3,090	2	6,340	27
Undistributed	XX	XX	502,000	XX	XX	XX	XX
Total or average	9,160,000 [3]	299,000 [3]	66,500,000	223	XX	7,260	XX

XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown. Table includes data available through July 9, 2009.

[2] Partial total; excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed."

[3] Excludes Washington, DC (which has no mineral production), with an area of 179 square kilometers and a population of 582,000.

[4] Revision to this data is to be published in the USGS Minerals Yearbook 2007—Total, 401,000.

Sources: U.S. Geological Survey and U.S. Census Bureau.

TABLE 5
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Alabama:						
Cement:						
Masonry	430	49,400 [e]	475	54,800 [e]	526	66,500 [e]
Portland	4,800	320,000 [e]	5,120	421,000 [e]	5,200	468,000 [e]
Clays:						
Bentonite	100	3,050	109	W	(3)	W
Common	2,120	29,600	2,280	29,000	2,210	38,800
Gemstones, natural	NA	356	NA	371	NA	398
Lime	2,280	164,000	2,240	181,000	2,450	224,000
Sand and gravel:						
Construction	14,700	65,300	15,700	70,500	20,100	96,000
Industrial	643	9,800	710	11,200	474	18,700
Stone:						
Crushed	47,800	296,000	50,300 [r]	329,000 [r]	55,400	365,000
Dimension	(3)	W	(3)	W	4	3,630
Combined values of clays (fire, kaolin), iron oxide pigments (crude), mica [crude (2005–06)], salt, stone [dimension (2004–05)] marble and sandstone), and values indicated by symbol W	XX	27,000	XX	30,500 [r]	XX	76,000
Total	XX	965,000	XX	1,130,000 [r]	XX	1,360,000
Alaska:						
Gemstones, natural	NA	12	NA	12	NA	13
Sand and gravel, construction	9,430	51,600	15,100 [r]	80,600 [r]	13,200	68,400
Stone, crushed	2,270	14,200	2,430 [r]	16,000 [r]	893 [4]	7,330 [4]
Combined values of cadmium (byproduct of zinc concentrates),[5] gold, lead, silver, stone [crushed limestone (2006)], zinc	XX	1,200,000	XX	1,410,000	XX	2,930,000
Total	XX	1,270,000	XX	1,500,000	XX	3,010,000
Arizona:						
Clays, bentonite	(3)	W	33	1,670	34	1,710
Copper[6]	723	2,130,000	690	2,640,000	712	4,950,000
Gemstones, natural	NA	1,450	NA	1,370	NA	1,560
Sand and gravel:						
Construction	79,600	430,000	84,900	516,000	94,000	662,000
Industrial	(3)	792	(3)	W	(3)	W
Stone, crushed	14,100	75,900	12,100 [r, 4]	72,400 [r, 4]	13,200	102,000
Combined values of cement, clays (common), gold gypsum (crude), lime, molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone [crushed traprock (2005), dimension sandstone], zeolites, and values indicated by symbol W	XX	709,000	XX	1,120,000	XX	1,020,000
Total	XX	3,350,000	XX	4,350,000	XX	6,740,000
Arkansas:						
Clays, common	1,150	1,510	1,210	1,900	1,140	2,550
Gemstones, natural	NA	590	NA	711	NA	439
Sand and gravel, construction	9,370	53,500	10,600	62,000	11,100	73,600
Silica stone[7] metric tons	655	3,660	576	2,290	227	992
Stone, crushed	34,100 [4]	173,000 [4]	37,200 [r, 4]	229,000 [r, 4]	34,800 [4]	236,000 [4]
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (crushed slate, dimension limestone and sandstone), tripoli	XX	299,000	XX	302,000	XX	475,000
Total	XX	531,000	XX	597,000 [r]	XX	789,000

See footnotes at end of table.

TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
California:							
Boron minerals		1,210	626,000	1,150	713,000	(3)	W
Cement:							
Masonry		(3)	W	694	80,600 [e]	698	89,500 [e]
Portland		11,900	1,000,000 [e]	11,600	1,130,000 [e]	10,900	1,190,000 [e]
Clays:							
Bentonite		24	2,640	20	2,200	24	2,510
Common		1,230	20,700	1,010	16,600	744	7,640
Fuller's earth		197	W	(3)	W	(3)	W
Gemstones, natural		NA	1,070	NA	1,130	NA	1,040
Gold[6]	kilograms	3,260	43,000	(3)	W	(3)	W
Sand and gravel:							
Construction		166,000	1,280,000	163,000	1,440,000	153,000	1,520,000
Industrial		1,990	55,700	2,030	60,400	1,670	57,800
Silver[6]	kilograms	801	172	269	63	(3)	W
Stone:							
Crushed		55,300 [4]	364,000 [4]	55,200 [r]	491,000 [r]	54,900	644,000
Dimension		42	10,200	41	10,200	40	10,000
Combined values of clays [fire (2006), kaolin], diatomite, feldspar, gypsum (crude), iron ore (usable shipped), lime, magnesium compounds, perlite (crude), pumice and pumicite, salt, soda ash, stone [crushed shell (2004)], talc [crude (2004, 2006)], zeolites, and values indicated by symbol W		XX	349,000	XX	332,000	XX	1,070,000
Total		XX	3,760,000	XX	4,280,000 [r]	XX	4,590,000
Colorado:							
Clays:							
Bentonite		5	W	(3)	W	(3)	40
Common		249	1,510	255	1,610	211	1,300
Gemstones, natural		NA	360	NA	358	NA	261
Lime		26	2,570	29	3,900	50	5,750
Sand and gravel:							
Construction		40,900	235,000	44,700	280,000	48,000	327,000
Industrial		(3)	3,300	(3)	W	(3)	W
Stone:							
Crushed		11,100	68,300	13,200 [r]	90,500 [r]	12,100	88,800
Dimension		16	1,980	18	2,400	18	2,400
Combined values of cement, gold, gypsum (crude), helium (Grade–A), molybdenum concentrates, silver, soda ash (2004), and values indicated by symbol W		XX	699,000	XX	1,380,000	XX	1,250,000
Total		XX	1,010,000	XX	1,750,000	XX	1,680,000
Connecticut:							
Clays, common		87	(8)	89	(8)	85	(8)
Gemstones, natural		NA	6	NA	6	NA	6
Sand and gravel, construction		8,330	55,600	8,400	64,200	8,780	75,600
Stone:							
Crushed		10,100	75,700	10,500 [r]	96,600 [r]	10,000	92,800
Dimension		(3)	(8)	(3)	(8)	(3)	(8)
Total		XX	131,000	XX	161,000 [r]	XX	168,000
Delaware:							
Gemstones, natural		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	(3)	(8)	(3)	(8)	(3)	(8)
Sand and gravel, construction		2,980	21,900	2,640	20,000	2,790	22,400
Stone, crushed		--	--	(3)	(8)	(3)	(8)
Total		XX	21,900	XX	20,000	XX	22,400

See footnotes at end of table.

TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Florida:						
Cement:						
Masonry	763	97,600 [e]	902	129,000 [e]	900	146,000 [e]
Portland	5,230	432,000 [e]	5,730	519,000 [e]	5,880	602,000 [e]
Clays:						
Common	(3)	W	4	W	3	W
Fuller's earth	234	W	279	39,700	259	24,400
Kaolin	31	3,280	29	3,510	23	2,900
Gemstones, natural	NA	1	NA	1	NA	1
Lime	24	2,090	23	2,940	(3)	W
Peat	478	9,710	464	9,450	496	10,000
Sand and gravel:						
Construction	29,300	146,000	37,500	210,000	40,000	266,000
Industrial	679	8,520	715	9,410	3,340	46,500
Stone, crushed	105,000 [4]	680,000 [4]	116,000 [r, 4]	1,010,000 [r, 4]	127,000	1,340,000
Combined values of magnesium compounds, phosphate rock, staurolite, stone [crushed sandstone (2004–05)], titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	945,000	XX	971,000 [r]	XX	786,000
Total	XX	2,320,000	XX	2,910,000 [r]	XX	3,220,000
Georgia:						
Clays:						
Common	1,550	8,710	1,530	8,730	1,510	9,150
Fuller's earth	1,400	142,000	874 [r]	82,600 [r]	747	64,300
Kaolin	6,780	898,000	7,190	825,000	6,920	945,000
Gemstones, natural	NA	9	NA	9	NA	9
Sand and gravel:						
Construction	9,270	39,400	11,100	68,300	10,900	71,000
Industrial	665	13,400	689	15,000	973	17,400
Stone:						
Crushed	79,700	548,000	80,700 [r]	631,000 [r]	90,800	816,000
Dimension	146	22,100	111 [r]	21,000	81	19,100
Combined values of barite, cement, feldspar, iron oxide pigments (crude), lime, mica (crude)	XX	134,000	XX	115,000	XX	140,000
Total	XX	1,810,000	XX	1,770,000 [r]	XX	2,080,000
Hawaii:						
Gemstones, natural	NA	262	NA	217	NA	107
Sand and gravel, construction	1,260	12,100	1,390	17,500	1,230	15,900
Stone, crushed	5,470	61,300	8,230 [r]	107,000 [r]	8,380	129,000
Total	XX	73,700	XX	125 000 [r]	XX	145,000
Idaho:						
Gemstones, natural	NA	836	NA	469	NA	388
Sand and gravel, construction	19,600	74,300	20,800	93,800	26,900	133,000
Stone, crushed	3,420	18,100	4,890 [r]	26,300 [r]	5,960	33,900
Combined values of cadmium (byproduct of zinc concentrates),[5] cement (portland), copper, feldspar, garnet (industrial), gold (2005–06), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone (dimension quartzite and sandstone), zeolites, zinc	XX	354,000	XX	788,000	XX	630,000
Total	XX	447,000	XX	908,000 [r]	XX	797,000

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Illinois:						
Cement, portland	3,010	233,000 [e]	3,240	286,000 [e]	3,110	308,000 [e]
Clays:						
Common	247	1,390	119	667	116	700
Fuller's earth	218	W	225	W	112	W
Gemstones, natural	NA	70	NA	14	NA	34
Sand and gravel:						
Construction	38,700	203,000	37,400	210,000	32,500	176,000
Industrial	4,950	86,200	5,510	104,000	5,410	102,000
Stone, crushed	75,300	462,000	76,400 [r]	549,000 [r]	75,400	573,000
Combined values of lime, peat, stone [dimension dolomite (2005)], tripoli, and values indicated by symbol W	XX	65,000	XX	64,500	XX	62,700
Total	XX	1,050,000	XX	1,210,000	XX	1,220,000
Indiana:						
Cement, portland	3,080	218,000 [e]	3,060	243,000 [e]	3,030	267,000 [e]
Clays, common	729	8,910 [r]	809	13,500	779	16,400
Gemstones, natural	NA	4	NA	4	NA	4
Sand and gravel, construction	28,300	116,000	28,400	135,000	29,300	153,000
Stone:						
Crushed	56,800	265,000	58,900 [r]	321,000 [r]	58,900	349,000
Dimension	251	45,500	240	46,300	233	39,000
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)	XX	130,000 [r]	XX	135,000	XX	157,000
Total	XX	784,000 [r]	XX	893,000 [r]	XX	982,000
Iowa:						
Clays, common	325	1,150	630	4,740	356	2,750
Gemstones, natural	NA	2	NA	2	NA	3
Sand and gravel, construction	17,100	74,300	19,900	93,100	17,500	86,700
Stone, crushed	35,800	219,000	36,400 [r]	271,000 [r]	36,300	288,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)	XX	239,000	XX	292,000	XX	319,000
Total	XX	534,000	XX	661,000 [r]	XX	696,000
Kansas:						
Cement, portland	2,690	212,000 [e]	2,890	244,000 [e]	3,000	286,000 [e]
Clays, common	621	7,460	654	4,590	697	7,440
Gemstones, natural	NA	1	NA	1	NA	1
Helium, Grade–A million cubic meters	82	189,000	90	226,000	85	245,000
Salt	2,890	127,000	2,890	135,000	2,630	144,000
Sand and gravel, construction	9,930	32,800	10,100	36,900	12,100	50,000
Stone:						
Crushed	20,600	122,000	22,300 [r]	160,000 [r]	22,000	171,000
Dimension	14	1,730	13	1,590	17	2,270
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)	XX	75,300	XX	63,100	XX	67,400
Total	XX	768,000	XX	872,000 [r]	XX	973 000
Kentucky:						
Clays, common	978	4,510	1,060	4,370	1,000	5,140
Gemstones, natural	NA	22	NA	78	NA	48
Sand and gravel, construction	10,300	49,700	10,500	55,000	10,100	54,400
Stone, crushed	62,100 [4]	384,000 [4]	61,600 [r]	446,000 [r]	59,000	435,000
Combined values of cement, clays (ball), lime, stone [crushed dolomite (2004)]	XX	253,000	XX	277,000 [r]	XX	311,000
Total	XX	691,000	XX	782,000 [r]	XX	806,000

See footnotes at end of table.

TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Louisiana:						
Clays, common	399	11,000 [r]	416	13,100	563	23,700
Gemstones, natural	NA	6	NA	6	NA	7
Salt	14,300	186,000	13,800	182,000	13,300	158,000
Sand and gravel:						
Construction	19,400	103,000	18,600	113,000	23,300	188,000
Industrial	476	14,800	509	11,600	663	16,100
Combined values of gypsum (crude), lime, stone (crushed limestone and sandstone)	XX	51,300	XX	78,500 [r]	XX	95,400
Total	XX	366,000 [r]	XX	398,000 [r]	XX	481,000
Maine:						
Clays, common	49	W	50	W	48	W
Gemstones, natural	NA	268	NA	272	NA	275
Sand and gravel, construction	10,800	49,100	11,100	57,400	10,400	62,400
Stone, crushed	4,370	29,500	4,450 [r]	30,800 [r]	4,920	37,600
Combined values of cement [masonry (2004, 2006), portland], peat, stone (dimension granite), and values indicated by symbol W	XX	39,300	XX	52,400	XX	57,400
Total	XX	118,000	XX	141,000	XX	158,000
Maryland:						
Cement, portland	2,520	175,000 [e]	2,550 [r]	210,000 [e]	2,650	237,000 [e]
Clays, common	262	571	317	686	286	851
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel, construction	12,700	75,500	12,300	89,500	11,900	96,700
Stone:						
Crushed	35,300	214,000	33,500 [r]	277,000 [r]	32,000	317,000
Dimension	27	9,580	26	3,010	14	1,750
Combined values of cement (masonry), lime, sand and gravel [(industrial (2004–05)]	XX	(8)	XX	(8)	XX	(8)
Total	XX	474,000	XX	580,000 [r]	XX	653,000
Massachusetts:						
Clays, common	36	(8)	37	(8)	36	(8)
Gemstones, natural	NA	1	NA	1	NA	1
Lime	(3)	(8)	(3)	(8)	(3)	(8)
Sand and gravel, construction	14,400	89,900 [r]	16,500	117,000	17,600	134,000
Stone:						
Crushed	13,700	109,000	14,500 [r]	121,000	14,300	149,000
Dimension	82	11,600	82	11,500	82	11,500
Total	XX	211,000	XX	250,000	XX	294,000
Michigan:						
Cement:						
Masonry	231	27,100 [e]	228	27,500 [e]	176	22,700 [e]
Portland	(3)	W	(3)	W	5,440	536,000 [e]
Clays, common	605	3,070	334	514	405	1,010
Gemstones, natural	NA	1	NA	1	NA	2
Gypsum, crude	452	5,660	1,050	10,700	1,050	9,980
Peat	122	3,360	117	3,300	(3)	W
Sand and gravel:						
Construction	69,500	254,000	64,800	243,000	50,500	215,000
Industrial	1,690	25,200	1,610	24,500	1,460	30,400
Stone, crushed	36,700 [4]	143,000 [4]	36,000 [r]	139,000 [r]	32,500	142,000
Combined values of bromine, iron ore (usable shipped), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone [crushed marl (2004), dimension, dolomite and sandstone], and values indicated by symbol W	XX	1,210,000	XX	1,300,000	XX	970,000
Total	XX	1,680,000	XX	1,750,000	XX	1,930,000

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Minnesota:						
Clays, common	20	22	20	22	32	40
Gemstones, natural	NA	6	NA	6	NA	6
Iron ore, usable shipped	41,400	1,560,000	40,600	1,830,000	40,400	2,160,000
Lime	(3)	(8)	(3)	(8)	(3)	(8)
Peat	63	5,210	68	5,670	69	5,280
Sand and gravel:						
Construction	54,900	235,000	54,100	253,000	50,300	240,000
Industrial	(3)	(8)	(3)	(8)	(3)	(8)
Stone:						
Crushed	10,400 [4]	64,900 [4]	10,500	87,400 [r]	12,400	121,000
Dimension	22	12,400	19	13,400	22	12,400
Total	XX	1,880,000	XX	2,190,000	XX	2 540,000
Mississippi:						
Clays:						
Bentonite	(3)	W	(3)	W	78	5,180
Common	610	2,700	642	2,860	549	3,100
Fuller's earth	381	35,200	354	33,000	338	33,600
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel, construction	14,100	80,700	14,400	85,200	19,300	133,000
Stone, crushed	2,760	34,200	3,520 [r]	47,800 [r]	3,050	53,000
Combined values of cement (portland), clays (ball), sand and gravel (industrial)	XX	41,500	XX	52,000	XX	42,400
Total	XX	194,000	XX	221,000 [r]	XX	270,000
Missouri:						
Cement, portland	5,260	388,000 [e]	5,330	464,000 [e]	5,240	500,000 [e]
Clays:						
Common	911	3,290	822	3,400	750	4,160
Fire	(3)	W	(3)	W	359	7,600
Sand and gravel:						
Construction	12,200	60,100 [r]	12,200	61,600	17,000	92,100
Industrial	589	14,200	559	14,500	595	16,400
Stone, crushed	92,600	564,000	87,400 [r]	647,000 [r]	83,600	631,000
Combined values of cadmium (byproduct of zinc concentratres),[5] cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	593,000	XX	666,000	XX	818,000
Total	XX	1,620 000	XX	1,860,000 [r]	XX	2 070,000
Montana:						
Clays, bentonite	102	8,400	(3)	W	(3)	W
Gemstones, natural	NA	653	NA	644	NA	379
Palladium[6] kilograms	13,700	102,000	13,300	87,100	14,400	150,000
Platinum[6] do.	4,040	110,000	3,920	113,000	4,290	158,000
Sand and gravel, construction	14,400	80,000	14,000	83,600	13,700	95,300
Stone:						
Crushed	4,090	13,700	3,430 [r]	16,600 [r]	3,570	19,200
Dimension	14	2,550	12	2,620	12	2,620
Combined values of cadmium (byproduct in zinc concentrates),[5] cement [masonry (2005–06), portland], clays (common), copper, garnet [industrial (2005)], gold, lead, lime, molybdenum concentrates, peat (2004–05), silver, talc (crude), zinc, and values indicated by symbol W	XX	303,000	XX	543,000 [r]	XX	641,000
Total	XX	621,000	XX	847,000	XX	1,070,000

See footnotes at end of table.

TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Nebraska:						
Cement:						
Masonry	(3)	(8)	(3)	(8)	(3)	(8)
Portland	(3)	(8)	(3)	(8)	(3)	(8)
Clays, common	133 [e]	338 [e]	160 [e]	(8)	158 [e]	(8)
Gemstones, natural	NA	4	NA	4	NA	4
Lime	11	514	12	625	13	700
Sand and gravel:						
Construction	15,100	53,200	14,300	60,200	13,100	62,000
Industrial	(3)	(8)	--	--	--	--
Stone, crushed	6,900	51,900	6,950	54,100 [r]	7,390	66,300
Total	XX	106,000	XX	115,000 [r]	XX	129,000
Nevada:						
Clays:						
Bentonite	7	W	7	W	(3)	W
Fuller's earth	(3)	W	25	W	(3)	W
Gold[6] kilograms	216,000	2,850,000	212,000	3,030,000	206,000	4,010,000
Mercury[9]	NA	NA	NA	NA	NA	NA
Sand and gravel, construction	43,100	197,000	52,300	230,000	45,500	224,000
Silver[6] kilograms	302,000	65,000	276,000	65,200	245,000	91,300
Stone, crushed	9,760	72,800	9,460 [r]	67,900 [r]	10,200	87,500
Combined values of barite, brucite (2004), cement (portland), clays (kaolin), copper, diatomite, gemstones (natural), gypsum (crude), lime, lithium carbonate, magnesite, perlite (crude), pumice and pumicite (2006), salt, sand and gravel (industrial), zeolites, and values indicated by symbol W	XX	286,000	XX	488,000	XX	724,000
Total	XX	3,470,000	XX	3,890,000 [r]	XX	5,140,000
New Hampshire:						
Gemstones, natural	NA	6	NA	6	NA	6
Sand and gravel, construction	8,940	46,600	8,400	47,400	9,500	61,600
Stone:						
Crushed	4,720	23,900	5,100	40,900	5,950	50,900
Dimension, granite	(3)	(8)	(3)	(8)	(3)	(8)
Total	XX	70,500	XX	88,200	XX	112,000
New Jersey:						
Clays, common	(3)	122	(3)	W	84	216
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	20,100	120,000	21,200	145,000	20,900	192,000
Industrial	2,020	35,800	1,820	34,100	1,520	40,600
Stone, crushed	25,400 [4]	185,000 [4]	24,500 [r]	172,000 [r]	46,300 [10]	315,000 [10]
Combined values of greensand marl, peat, stone [crushed miscellaneous (2004)], and value indicated by symbol W	XX	4,400	XX	4,110	XX	(8)
Total	XX	345,000	XX	356,000 [r]	XX	547,000 [10]
New Mexico:						
Clays, common	34	177	36	221	35	228
Copper[6]	122	362,000	131	502,000	113	784,000
Gemstones, natural	NA	20	NA	19	NA	23
Helium (Grade–A) million cubic meters	(3)	W	--	--	(3)	W
Sand and gravel:						
Construction	13,600	89,500	16,000	112,000	18,400	157,000
Industrial	--	--	113	W	184	W

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
New Mexico—Continued:						
Silver[6] kilograms	3,570	767	6,390	1,510	(3)	W
Stone:						
Crushed	2,830 [4]	16,400 [4]	3,750 [r]	25,400 [r]	3,510	23,200
Dimension	57	2,430	7	279	(3)	W
Combined values of cement, gold, gypsum (crude), helium [Grade–A (2004, 2006)], lime, mica [crude (2004)], molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, stone [crushed granite (2004)], zeolites, and values indicated by symbol W	XX	397,000	XX	513,000	XX	509,000
Total	XX	868,000	XX	1,150,000	XX	1,470,000
New York:						
Clays, common	756	10,900	785	11,700	813	30,400
Gemstones, natural	NA	74	NA	78	NA	90
Gypsum, crude	--	--	2,230	11,400	413	2,120
Salt	6,430	301,000	6,840	327,000	6,090	257,000
Sand and gravel, construction	33,100	189,000	31,300	204,000	35,000	236,000
Stone:						
Crushed	49,400	327,000	52,600 [r]	447,000 [r]	52,100	435,000
Dimension	44	4,560	42	7,470	39	3,860
Combined values of cement, garnet (industrial), peat, sand and gravel [industrial (2004, 2006)], talc (crude), wollastonite, zinc	XX	256,000	XX	286,000	XX	368,000
Total	XX	1,090,000	XX	1,290 000	XX	1,330,000
North Carolina:						
Clays:						
Common	2,260	12,900	2,180	13,900	2,340	24,200
Kaolin	34	764	27	593	26	950
Feldspar	351	20,500	351	19,000	362	19,100
Gemstones, natural	NA	280	NA	280	NA	282
Mica, crude	40	9,600	39	10,200	57	12,600
Sand and gravel:						
Construction	11,500	59,700	12,000	63,900	12,900	70,000
Industrial	1,630	29,000	1,150	29,200	1,220	24,700
Stone:						
Crushed	72,300	549,000	73,600 [r, 4]	708,000 [r, 4]	77,500	852,000
Dimension	43	18,200	39	17,000	41	17,800
Combined values of olivine (2004), phosphate rock, pyrophyllite (crude), stone [crushed quartzite (2005)]	XX	105,000	XX	(8)	XX	(8)
Total	XX	805,000	XX	862,000 [r]	XX	1,020,000
North Dakota:						
Clays, common	(3)	186	76	W	105	W
Gemstones, natural	NA	4	NA	4	NA	4
Sand and gravel, construction	11,700	32,800	11,300	34,500	14,000	43,700
Stone, crushed	(3)	W	89	396	147	683
Combined values of lime, sand and gravel (industrial), stone [crushed miscellaneous (2004)], and values indicated by symbol W	XX	11,300	XX	(8)	XX	(8)
Total	XX	44,300	XX	34,900 [r]	XX	44,400
Ohio:						
Cement:						
Masonry	98 [r]	13,000 [r, e]	(3)	W	(3)	W
Portland	1,020 [r]	85,700 [r, e]	986	89,200 [e]	966	96,100 [e]
Clays:						
Common	1,360	7,480	1,310	6,880	1,580	17,800
Fire	42	W	55	W	(3)	W
Gemstones, natural	NA	4	NA	4	NA	4
Lime	1,880	127,000	1,790	130,000	1,850	150,000

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Ohio—Continued:						
Sand and gravel:						
Construction	50,800	263,000	51,700	288,000	46,300	289,000
Industrial	1,180	34,200	1,230	37,900	1,110	33,800
Stone:						
Crushed	76,500	396,000	75,200	439,000[r]	68,500	427,000
Dimension	38	5,100	28	4,880	29	4,950
Combined values of peat, salt, and values indicated by symbol W	XX	197,000	XX	211,000	XX	251,000
Total	XX	1,130,000	XX	1,210,000	XX	1 270,000
Oklahoma:						
Clays, common	1,150	2,410	903	2,520	1,180	4,700
Gemstones, natural	NA	4	NA	43	NA	106
Gypsum, crude	3,250	20,800	2,620	18,400	3,860	27,400
Iodine, crude metric tons	1,130	W	1,570	W	(3)	W
Sand and gravel:						
Construction	12,000	53,700	13,300	65,000	17,000	91,900
Industrial	1,390	31,600	1,480	33,500	1,640	40,400
Stone:						
Crushed	39,800	206,000	47,300[r]	269,000[r]	43,300	255,000
Dimension	17	2,100	3	501	3	502
Tripoli metric tons	32,100	2,120	30,600	1,950	18,400	1,890
Combined values of cement, feldspar, helium (Grade–A), lime, salt, and values indicated by symbol W	XX	199,000	XX	227,000	XX	263,000
Total	XX	519,000	XX	618,000[r]	XX	684,000
Oregon:						
Clays, bentonite	10	W	(3)	W	(3)	W
Gemstones, natural	NA	1,210	NA	1,180	NA	1,860
Sand and gravel, construction	21,000	125,000	22,000	146,000	23,800	175,000
Stone, crushed	22,700	126,000	26,800[r]	164,000[r]	25,000	189,000
Combine values of cement (portland), clays (common), diatomite, lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by symbol W	XX	114,000	XX	128,000	XX	143,000
Total	XX	367,000	XX	439,000[r]	XX	509,000
Pennsylvania:						
Cement:						
Masonry	(3)	W	399	49,700[e]	384	52,200[e]
Portland	6,230	473,000[e]	6,290	554,000[e]	6,020	599,000[e]
Clays, common	822	3,270	705	3,460	742	5,630
Gemstones, natural	NA	1	NA	1	NA	1
Lime	1,220	100,000	1,100	104,000	1,160	115,000
Peat	11	307	7	210	1	52
Sand and gravel:						
Construction	20,000	127,000	17,000	111,000	18,400	126,000
Industrial	(3)	W	711	15,400	696	15,500
Stone:						
Crushed	113,000	639,000	107,000[r]	713,000[r]	111,000	788,000
Dimension	33	10,100	35	11,800	38	12,800
Combined value of tripoli and values indicated by symbol W	XX	55,800	XX	(8)	XX	(8)
Total	XX	1,410,000	XX	1,560,000[r]	XX	1,710,000
Rhode Island:						
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	2,490	22,000	2,510	23,000	2,430	25,800
Industrial	(3)	(8)	(3)	(8)	(3)	(8)
Stone, crushed	1,600[4]	12,400[4]	1,610[4]	12,300[r,4]	2,320[4]	18,000[4]
Total	XX	34,400	XX	35,300[r]	XX	43,700

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
South Carolina:						
Cement:						
Masonry	453	49,900 [e]	498	54,300 [e]	575	68,900 [e]
Portland	3,110	196,000 [e]	3,270	247,000 [e]	3,320	294,000 [e]
Clays:						
Common	1,050	3,350	1,020	3,610	992	4,250
Fire	1	64	54	892	60	348
Kaolin	296	19,600	287	17,700	294	17,900
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	9,960	35,100	11,100	45,200	10,900	51,100
Industrial	719	17,600	794	19,400	905	21,800
Stone:						
Crushed	31,300	210,000	33,800 [4]	258,000 [4]	30,400 [4]	261,000 [4]
Dimension	9	850	9	850	9	850
Combined values of mica (crude), stone [crushed marble (2005–06)], vermiculite (crude)	XX	(8)	XX	12,600	XX	15,200
Total	XX	532,000	XX	659,000	XX	735,000
South Dakota:						
Clays, common	188	W	183	W	176	W
Sand and gravel, construction	14,000	51,700	12,800	45,500	16,400	59,800
Stone, crushed	6,410	27,600	6,740 [r]	32,400 [r]	6,320	34,600
Combined values of cement (portland), feldspar, gemstones (natural), gold, gypsum (crude), iron ore [usable shipped (2005–06)], lime, mica (crude), stone (dimension granite), and values indicated by symbol W	XX	131,000	XX	139,000	XX	129,000
Total	XX	211,000 [r]	XX	217,000 [r]	XX	223,000
Tennessee:						
Clays:						
Ball	762	34,300	740	32,500	736	32,300
Common	365	3,140	372	3,210	231	1,530
Fuller's earth	(3)	W	91	W	(3)	W
Kaolin	(3)	W	1	W	(3)	W
Sand and gravel:						
Construction	7,830	47,500	7,570	51,500	8,500	57,900
Industrial	975	26,100	985	26,500	1,010	29,300
Stone, crushed	57,900	381,000	66,500 [r]	483,000 [r]	65,300	517,000
Combined values of cadmium [byproduct in zinc concentrates (2004)], cement, gemstones (natural), lime, salt, stone (dimension marble), zinc (2004), and values indicated by symbol W	XX	160,000	XX	174,000	XX	218,000
Total	XX	652,000	XX	771,000 [r]	XX	856,000
Texas:						
Cement:						
Masonry	319	38,000 [e]	395	48,500 [e]	382	50,700 [e]
Portland	11,200	800,000 [e]	11,600	951,000 [e]	11,300	1,070,000 [e]
Clays:						
Ball	(3)	W	(3)	7,730	(3)	W
Bentonite	(3)	W	(3)	W	71	2,300
Common	2,160	8,890	2,340	8,680	2,360	12,600
Gemstones, natural	NA	201	NA	201	NA	202
Gypsum, crude	2,450	18,800	1,540	11,800	1,430	11,800
Lime	1,630	115,000	1,610	112,000	1,650	130,000
Salt	9,780 [r]	118,000	9,600	118,000	9,570	132,000

See footnotes at end of table.

TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Texas—Continued:						
Sand and gravel:						
Construction	81,700	436,000	80,700	472,000	99,500	603,000
Industrial	2,790	109,000	2,840	114,000	1,530	65,600
Stone:						
Crushed	122,000	621,000	137,000 [r]	820,000 [r]	136,000	824,000
Dimension	64	15,200	44	12,200	31	12,600
Talc, crude	258	W	(3)	W	(3)	W
Combined values of brucite, clays (fuller's earth, kaolin), helium, zeolites, and values indicated by symbol W	XX	46,300	XX	41,500 [r]	XX	68,200
Total	XX	2,330,000	XX	2,720,000	XX	2,980,000
Utah:						
Beryllium concentrates metric tons	2,210	NA	2,780	NA	3,830	NA
Clays:						
Bentonite	73	W	(3)	W	(3)	W
Common	443	5,600	478	6,710	526	10,700
Gemstones, natural	NA	235	NA	235	NA	238
Salt	2,250	107,000	2,250	132,000	2,810	149,000
Sand and gravel, construction	29,800	125,000	33,900	149,000	38,000	183,000
Stone, crushed	8,030	45,100	8,570 [r]	52,100 [r]	9,860	59,800
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade–A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by symbol W	XX	1,660,000	XX	2,460,000	XX	3,560,000
Total	XX	1,950 000	XX	2,800 000 [r]	XX	3,960 000
Vermont:						
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel, construction	4,970	24,000	5,240	32,000	5,810	37,300
Stone:						
Crushed	5,110	30,800	4,960 [r, 4]	37,900 [r, 4]	2,070 [4]	19,300 [4]
Dimension	100	30,600	98	27,800	100	27,600
Talc, crude	(3)	(8)	(3)	(8)	(3)	(8)
Total	XX	85,400	XX	97,700 [r]	XX	84,200
Virginia:						
Clays:						
Bentonite	5	W	--	--	--	--
Common	994	4,640	983	4,690	762	1,810
Kyanite[e]	90	13,400	90	13,400	90	14,000
Sand and gravel, construction	12,800	75,800	12,000	85,800	14,200	110,000
Stone:						
Crushed	73,700 [4]	540,000 [4]	85,700 [r]	772,000 [r]	74,800 [4]	814,000 [4]
Dimension	5	594	6	631	6	631
Talc, crude	--	--	1	15	(3)	W
Combined values of cement, clays (fuller's earth), feldspar, gemstones (natural), iron oxide pigments (crude), lime, sand and gravel (industrial), stone [crushed marble (2004, 2006)], titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates, and values indicated by symbol W	XX	256,000	XX	272,000	XX	333,000
Total	XX	891,000	XX	1,150,000 [r]	XX	1,270,000
Washington:						
Clays:						
Common	(3)	W	(3)	W	53	149
Fire	--	--	--	--	25	41
Gemstones, natural	NA	44	NA	44	NA	49
Sand and gravel, construction	41,500	227,000	47,200	282,000	48,400	315,000

See footnotes at end of table.

TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Washington—Continued:						
Stone, crushed	12,100	75,500	14,300 [r]	101,000 [r]	12,500	127,000
Combined values of cadmium (byproduct in zinc concentrates),[5] cement (portland), diatomite, gold (2004–05), lead, lime, olivine, peat, sand and gravel (industrial), silver (2004–05), stone (dimension miscellaneaous), zinc, and values indicated by symbol W	XX	205,000	XX	255,000	XX	277,000
Total	XX	507,000	XX	638,000 [r]	XX	718,000
West Virginia:						
Clays, common	161	441	186	524	(3)	W
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	524	2,500	318	1,630	429	3,470
Industrial	343	17,300	369	17,800	333	17,200
Stone, crushed	14,700	72,600	14,600 [r]	108,000 [r]	14,500	120,000
Combined values of cement, lime, peat, salt, stone (dimension sandstone), and value indicated by symbol W	XX	73,500	XX	81,100	XX	89,100
Total	XX	166,000	XX	209,000 [r]	XX	230,000
Wisconsin:						
Cement, portland	(3)	(8)	(3)	(8)	--	--
Gemstones, natural	NA	6	NA	6	NA	6
Lime	850	53,900	888	61,300	922	70,700
Peat	(3)	(8)	(3)	(8)	(3)	(8)
Sand and gravel:						
Construction	43,400	178,000	43,200	191,000	39,600	182,000
Industrial	2,140	47,000	2,250	55,700	2,450	74,100
Stone:						
Crushed	39,300	172,000	39,800 [r]	234,000 [r]	35,800	204,000
Dimension	232	23,800	278	27,600	297	35,400
Total	XX	475,000	XX	570,000 [r]	XX	566,000
Wyoming:						
Clays:						
Bentonite	3,510	151,000	4,160	190,000	4,360	209,000
Common	49	107	53	128	53	206
Gemstones, natural	NA	13	NA	14	NA	14
Sand and gravel, construction	10,200	40,100	11,700	52,400	17,200	74,600
Stone, crushed	6,300	35,300	6,990 [r]	39,800 [r]	12,600	71,300
Combined values of cement (portland), gypsum (crude), helium (Grade–A), lime, soda ash, zeolites	XX	819,000	XX	1,010,000	XX	1,240,000
Total	XX	1,050,000	XX	1,300,000	XX	1,590,000
Undistributed:						
Connecticut, Delaware, Maryland, Massachusetts, Minnesota, Nebraska, New Hampshire, New Jersey (2006), North Carolina (2005–06), North Dakota (2005–06), Pennsylvania (2005–06), Rhode Island, South Carolina (2004), Vermont, Wisconsin, undistributed	XX	205,000 [r]	XX	448,000 [r]	XX	502,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Combined values" data for each State. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown. Table includes data available through July 9, 2009.

[3]Withheld to avoid disclosing company proprietary data.

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[4] Excludes certain stones; kind and value included in "Combined value."

[5] Data not available for 2006.

[6] Recoverable content of ores, etc.

[7] Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[8] Withheld to avoid disclosing company proprietary data; values included in "Undistributed."

[9] Secondary production.

[10] Revisions to this data are to be published in the USGS Minerals Yearbook 2007—Quantity, 24,100; Value, 169,000; Total, 401,000.

TABLE 6
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,580	W	1,580	W	1,550	W
Clays, common	114	585	116	596	111	614
Lime	11	2,250	11	2,250	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	8,660	57,600	8,300 [r]	55,500 [r]	8,790	60,700
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	125,000	XX	153,000	XX	163,000
Total	XX	187,000	XX	213,000 [r]	XX	228,000
Administered Islands:						
American Samoa, stone, crushed, traprock	(3)	(3)	(3)	(3)	(3)	(3)
Guam, stone, crushed	1,410	13,000	1,410	13,000	900	9,330
Virgin Islands, stone, crushed, limestone and traprock	(3)	(3)	257	2,730	210	2,010
Total	XX	13,000	XX	15,800	XX	11,300

[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Withheld to avoid disclosing company proprietary data.

TABLE 7

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	2,370,000	5,410,000	2,820,000	7,550,000
Manufactures	do.	135,000	482,000	143,000	591,000
Antimony:					
Metal, alloys, waste and scrap	do.	740	3,250	459	1,860
Oxide, antimony content	do.	1,400	5,860	1,680	8,870
Arsenic metal, arsenic content	do.	3,270[r]	8,740[r]	3,060	5,960
Bauxite and alumina:					
Alumina, calcined equivalent		1,210	631,000	1,540	811,000
Bauxite:					
Calcined, refractory and other grade		18	2,330	13	2,390
Crude and dried		34	7,020	20	3,990
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	26,900	21,600	44,000	42,400
Beryllium, unwrought, and waste and scrap, other including articles not elsewhere specified	kilograms	201,000	18,600[r]	135,000	21,500
Bismuth, metal, alloys, waste and scrap, bismuth content	do.	142,000	4,760	311,000	3,540
Cadmium:					
Metal, includes cadmium in alloys and scrap	do.	668,000	1,330	460,000	2,210
Sulfide, gross weight	do.	120,000	55	62,000	32
Chromium:					
Ores and concentrate	metric tons	42,600	9,940	53,900	10,200
Metals and alloys:					
Metal, unwrought powders, waste and scrap, other	do.	1,020	16,900	1,020	21,300
Ferroalloys, high-carbon, low-carbon, ferrochromium-silicon	do.	36,300	38,900	35,700	38,100
Chemicals:					
Oxides, trioxides and other	do.	10,700	18,300	11,700	20,500
Sulfates	do.	79	376	35	145
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	37,900	27,200	29,900	24,400
Pigments and preparations	do.	767	4,090	1,330	6,620
Cobalt:					
Acetates and chlorides	do.	703	3,820	535	3,300
Oxides and hydroxides	do.	829	17,100	1,100	26,800
Metal:					
Unwrought, powders, waste and scrap, mattes, other intermediate products of metallurgy	do.	1,670	60,600	1,930	60,500
Wrought and cobalt articles	do.	2,340	91,800	1,980	90,400
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	do.	260,000	467,000	328,000	1,160,000
Semimanufactures	do.	254,000	1,100,000	284,000	1,940,000
Scrap, alloyed and unalloyed	do.	658,000	1,060,000	803,000	1,190,000
Ferroalloys not listed elsewhere:					
Ferrophosphorous	do.	1,780	1,150	1,820	2,270
Other	do.	2,200	3,190	3,150	5,740
Gold:					
Ores and concentrates	kilograms	1,380	13,400	2,690	31,800
Dore and precipitates	do.	141,000	2,020,000	159,000	2,670,000
Bullion, refined	do.	182,000	2,550,000	228,000	4,380,000
Waste and scrap	do.	563,000	670,000	567,000	1,270,000
Metal powder	do.	687	9,280	1,320	25,400
Compounds	do.	1,310,000	30,900	1,460,000	28,100
Iron and steel:					
Steel mill products		8,520[r]	NA	8,830	NA
Fabricated steel products		1,710	NA	1,540	NA
Cast iron and steel products		193	NA	268	NA

See footnotes at end of table.

TABLE 7—Continued
U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product	2005		2006	
	Quantity	Value	Quantity	Value
Metals—Continued:				
Iron and steel scrap:				
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping	13,000	3,430,000	14,900	4,230,000
Pig iron, all grades	51	8,110	813	8,750
Direct-reduced iron, steelmaking grade	(2)	16	(2)	11
Ships, boats, and other vessels for scrapping	3	476	5	509
Used rails for rerolling and other uses, includes mixed (used plus new) rails	55	25,600	51	36,400
Iron ore	11,800	584,000	8,270	636,000
Lead:				
Base bullion, Pb content metric tons	198	1,290	197	1,560
Ore and concentrates, Pb content do.	390,000	190,000	298,000	278,000
Unwrought and alloys, Pb content do.	45,500	46,100	52,700	57,800
Wrought and alloys, Pb content do.	19,000	40,800	15,800	40,200
Scrap, gross weight do.	67,300	21,600	121,000	37,200
Magnesium:				
Waste and scrap, Mg content do.	5,630	13,100	3,680	8,410
Metal, Mg content do.	732	2,470	4,170	9,520
Alloys, gross weight do.	1,200	5,870	2,290	8,200
Powder, sheets, tubing, ribbons, wire, other forms, gross weight do.	2,080	22,400	2,180	25,500
Manganese, gross weight:				
Ores and concentrates with 20% or more manganese do.	13,500	3,940	2,240	1,120
Ferromanganese, all grades do.	14,400	14,900	21,700	14,100
Silicomanganese do.	900 [r]	1,220	947	888
Metal, including alloys and waste and scrap do.	2,670	5,960	3,900	9,610
Dioxide do.	5,900	5,040	5,820	5,580
Mercury:				
Metal do.	319	5,810	390	5,870
Amalgams of precious metals whether or not chemically defined do.	1,230 [r]	231,000	397	430,000
Molybdenum:				
Ore and concentrates, including roasted and other, Mo content do.	46,400	1,450,000	37,200	1,460,000
Chemicals:				
Oxides and hydroxides, gross weight do.	14,600	375,000	11,600	300,000
Molybdates, all, gross weight do.	2,150	54,500	2,030	51,800
Ferromolybdenum, Mo content do.	2,090	43,400	2,010	42,500
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight do.	2,030	139,000	2,010	143,000
Nickel, Ni content:				
Primary, unwrought and chemicals do.	7,630	219,000	8,050	286,000
Secondary, stainless steel scrap and waste and scrap do.	55,600	731,000	59,300	866,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes do.	1,340	26,700	1,230	28,300
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles, gross weight do.	37,700	819,000	39,200	1,120,000
Niobium (columbium) and tantalum:				
Niobium:				
Ores and concentrates do.	43	398	69	914
Ferroniobium do.	410	4,210	706	6,680
Tantalum:				
Ores and concentrates, includes synthetic do.	546 [r]	9,290 [r]	784	13,400
Unwrought, waste and scrap, powders, alloys, metal do.	699	136,000	611	73,400
Wrought do.	110	49,000	91	39,100
Platinum-group metals:				
Palladium, Pd content kilograms	27,000	122,000	53,100	402,000
Platinum, includes waste and scrap and metal, Pt content do.	45,600 [r]	930,000 [r]	72,900	1,760,000
Iridium, osmium, ruthenium, gross weight do.	1,080 [r]	7,200 [r]	3,390	35,800
Rhodium, Rh content do.	615	28,900	1,600	108,000
Rare earths, estimated rare-earth oxide content:				
Cerium compounds do.	2,220,000	13,600	2,010,000	19,800
Compounds, inorganic and organic do.	2,070,000	14,100	2,700,000	17,300

See footnotes at end of table.

TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Rare earths, estimated rare-earth oxide content—Continued:					
Metals, including scandium and yttrium	do.	636,000	5,180	733,000	6,960
Ferrocerium and other pyrophoric alloys	do.	4,320,000	18,000	3,710,000	11,000
Selenium, Se content	do.	254,000	3,040	191,000	2,970
Silicon, gross weight:					
Ferrosilicon	metric tons	13,400	13,400	9,330	10,400
Metal	do.	23,400	847,000	27,100	1,270,000
Silver:					
Bullion, Ag content	kilograms	166,000	45,900	1,500,000	586,000
Dore, Ag content	do.	132,000	35,000	85,400	33,600
Metal powder, gross weight	do.	708,000 r	122,000 r	1,460,000	255,000
Nitrate, gross weight	do.	61,500 r	5,720 r	62,300	6,450
Ores and concentrates, Ag content	do.	3,680	834	3,150	4,040
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	269,000 r	48,300 r	526,000	91,200
Waste and scrap, gross weight	do.	2,240,000 r	424,000 r	4,890,000	1,140,000
Unwrought, other, gross weight	do.	39,600 r	8,690 r	85,600	30,800
Thallium, unwrought powders, waste and scrap, others	do.	252	102	NA	NA
Thorium and thorium-bearing materials, thorium ore, monazite concentrate, compounds	do.	737	281	1,090	424
Tin:					
Ingots and pigs	metric tons	4,330	30,500	5,490	40,500
Tin scrap and other tin bearing material, except tinplate scrap, includes rods, profiles, wire, powders, flakes, tubes, pipes	do.	32,800	51,200	23,500	63,000
Tinplate and terneplate	do.	252,000	188,000	198,000	137,000
Titanium:					
Metal, waste and scrap, unwrought, wrought products and castings, ferrotitanium and ferrosilicon titanium	do.	39,500	677,000	30,800	1,040,000
Ores and concentrates	do.	20,900	8,930	32,800	11,800
Pigment, dioxide and oxide	do.	524,000	1,060,000	581,000	1,080,000
Tungsten, W content:					
Ammonium paratungstate	do.	774	8,810	350	4,970
Carbide powder	do.	1,560	37,800	1,010	35,100
Metal powders	do.	750 e	28,500	959 e	45,300
Miscellaneous tungsten-bearing materials, ferrotungsten, ferrosilicon tungsten, unwrought, waste and scrap, wrought, compounds	do.	2,810	63,400	3,990	91,800
Ores and concentrates	do.	52 e	1,600	130 e	3,550
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	15,100,000	45,600	7,650,000	54,500
Ferrovanadium, V content	do.	505,000 r	19,300	515,000	11,400
Metal, including waste and scrap, gross weight	do.	293,000	16,400	491,000	13,200
Pentoxide, anhydride, V content	do.	254,000	5,470	341,000	7,150
Other oxides and hydroxides, V content	do.	899,000	15,400	832,000	7,780
Zinc:					
Compounds, chloride, chromates of zinc or of lead, compounds n.s.p.f., lithopone, oxide, sulfate, sulfide, gross weight	metric tons	21,900 r	30,900 r	74,800	76,100
Ores and concentrates, Zn content	do.	786,000	477,000	825,000	1,060,000
Rolled	do.	8,760	10,400	3,780	16,000
Slab	do.	784	1,500	2,530	3,800
Zirconium:					
Ferrozirconium	do.	65	100	491	853
Ores and concentrates	do.	101,000	74,000	76,300	69,200
Oxide, includes germanium oxides and zirconium dioxides	do.	2,260	21,000	3,340	29,800
Unwrought powders	do.	175	3,620	202	5,310
Waste and scrap	do.	1,800	90,300	1,680	120,000
Total		XX	29,200,000 r	XX	42,200,000
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude	do.	13,900	45,100	15,300	41,200

See footnotes at end of table.

TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Abrasives, manufactured—Continued:					
Metallic abrasives	do.	26,900	21,600	22,300	24,400
Silicon carbide, crude, ground and refined	do.	15,600	17,400	20,200	28,700
Asbestos, includes reexports:					
Manufactured		NA	374,000	NA	443,000
Unmanufactured	metric tons	1,510	398 [r]	3,410	866
Barite, natural barium sulfate	do.	92,700	9,930	71,500	11,900
Boron minerals and compounds:					
Boric acid, includes orthoboric and anhydrous		183	96,800	221	127,000
Sodium borates		308	110,000	393	139,000
Bromine:					
Compounds, includes methyl bromine and ethylene dibromide, Br content	metric tons	6,830	12,800 [r]	7,920	17,600
Elemental, gross weight	do.	2,710	3,990	4,320	5,180
Cement, hydraulic and clinker		803	68,300	1,550	114,000
Clays:					
Ball		141	8,840	140	7,890
Bentonite		847	98,500	1,270	132,000
Fire		368	34,400	348	38,100
Fuller's earth		55	13,500	69	16,400
Kaolin		3,580	601,000	3,540	626,000
Other, n.e.c., includes chamotte or dinas earth, activated clays and earths, artifically activated clays		634	173,000	607	181,000
Diamond:					
Gemstones, natural, including reexports	thousand carats	25,700	8,470,000	32,600	9,540,000
Industrial including exports and reexports:					
Unworked	do.	1,430	26,100	1,560	26,900
Powder, dust and grit, natural and synthetic	do.	104,000	59,200 [r]	99,700	58,800
Diatomite		142	60,400	150	158,000
Feldspar	metric tons	15,200	2,070	10,400	1,940
Fluorspar	do.	36,100	7,840	13,000	2,430
Garnet, industrial[e]		13	9,700	13	9,450
Graphite, natural and artificial	metric tons	56,200	109,000	58,600	124,000
Gypsum and gypsum products:					
Crude		148	16,400	143	18,300
Plasters		174	33,700	209	36,700
Boards		86	58,900	98	69,900
Other		XX	33,000	XX	37,400
Helium, Grade-A	million cubic meters	51	99,100	62	126,000
Iodine:					
Crude/resublimed	metric tons	2,660	27,900	2,020	34,400
Potassium iodide	do.	68	1,550	82	1,950
Iron oxide pigments and hydroxides:					
Pigment grade	do.	2,220	6,170	3,100	8,090
Other grade	do.	73,100	47,100	68,300	44,400
Kyanite, andalusite, sillimanite[e]		35	7,200	35	7,600
Lime		133	17,500	116	19,200
Lithium chemicals:					
Carbonate	metric tons	4,190	13,700	3,130	10,500
Hydroxide	do.	5,620	20,100	5,540	27,900
Magnesium compounds:					
Compounds, chlorides, hydroxide and peroxide, sulfates	do.	32,700	19,500	31,700	21,900
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	4,920	2,500	5,690	3,210
Dead-burned and fused magnesia	do.	24,900	11,400	20,000	11,400
Other magnesia	do.	21,700	18,300	21,200	18,900
Crude	do.	21,800	2,490	9,020	1,080

See footnotes at end of table.

TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005 Quantity	2005 Value	2006 Quantity	2006 Value
Industrial minerals—Continued:					
Mica:					
Scrap and flake:					
Powder	do.	7,140	4,860	4,990	4,650
Waste	do.	1,480	343	1,710	452
Sheet:					
Unworked	do.	74	269	113	273
Worked	do.	1,350	13,900	1,280	15,100
Peat		36	4,020	41	5,030
Perlite, crude[e]	metric tons	32,000	1,300	30,000	1,290
Potash:					
Potassium chloride	do.	136,000	NA	337,000	NA
Potassium sulfates, all grades	do.	429,000	NA	467,000	NA
Potassium nitrate	do.	3,910	2,250	3,750	2,520
Pumice and pumicite		21 [r]	7,520	22	5,940
Salt		879	51,800	973	54,900
Sand and gravel:					
Construction:					
Sand		137	23,400	113	19,700
Gravel		382	4,800	402	4,410
Industrial		2,910	154,000	3,830	183,000
Silica, special stone products		NA	10,000	NA	9,900
Soda ash		4,680	640,000	4,820	736,000
Stone:					
Crushed		1,270	50,500	1,140	57,300
Dimension		XX	66,100	XX	76,000
Strontium compounds:					
Carbonate, precipitated	metric tons	65 [r]	196	150	157
Oxide, hydroxide, peroxide	do.	301	176	871	594
Sulfur:					
Elemental		684	55,200	635	43,800
Sulfuric acid, 100% H_2SO_4	metric tons	338,000	29,500	248,000	21,800
Talc, excludes powders, talcum (in package), face, compact		198	41,800	179	42,600
Vermiculite[e]		5	970	5	930
Wollastonite[e]	metric tons	7,000	2,100	3,000	900
Zeolites[e]	do.	5,000	1,000	1,000	200
Total		XX	12,000,000 [r]	XX	13,700,000
Grand total		XX	41,200,000 [r]	XX	55,800,000

[e] Estimated. [r] Revised. NA Not available. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Less than ½ unit.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

		2005		2006	
Mineral or product		Quantity	Value	Quantity	Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	5,330,000	11,500,000	5,180,000	14,500,000
Manufactures	do.	337,000	964,000	344,000	1,200,000
Antimony:					
Metal	do.	6,370	20,400	7,260	31,800
Ore and concentrate, antimony content	do.	204	622	153	653
Oxide, antimony content	do.	22,700	81,600	23,000	102,000
Arsenic:					
Acid	do.	9	50	24	52
Metal	do.	812	3,410	1,070	3,640
Sulfide	do.	--	--	75	179
Trioxide	do.	11,000	5,280	12,400	6,020
Bauxite and alumina:					
Alumina, calcined equivalent		1,860	639,000	1,860	791,000
Bauxite:					
Calcined, refractory and other grade		818 r	76,700 r	753	86,400
Crude and dried		11,800 r	305,000 r	11,600	332,000
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	14,800	7,620	25,500	12,700
Beryllium, ore, concentrates, oxide, hydroxide, unwrought including powders, waste and scrap, other, beryllium-copper master alloys, beryllium-copper plates, sheets, strip	kilograms	1,040,000	16,300	1,380,000	19,000
Bismuth, metallic	do.	2,530,000	20,500	2,300,000	21,900
Cadmium:					
Metal	do.	81,300	1,040	1,220	1,110
Sulfide, gross weight	do.	8,760	75	115,000	350
Chromium:					
Chromite ore	metric tons	165,000	23,100	150,000	23,500
Metals and alloys:					
Ferroalloys, high-carbon, low-carbon, ferrochromium-silicon	do.	478,000	408,000	459,000	389,000
Metal, unwrought powders, waste and scrap, other	do.	11,000	87,700	10,900	89,000
Chemicals:					
Oxides, hydroxides, trioxides and other	do.	14,600	32,600	11,400	26,000
Sulfates	do.	288	438	422	823
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	9,890	7,460	16,800	12,700
Carbide	do.	131	2,150	126	2,010
Pigments and preparations based on chromium	do.	7,510	22,100	6,550	21,700
Cobalt:					
Metal:					
Alloys, unwrought, waste and scrap, wrought, cobalt articles	do.	1,170	28,200 r	997	29,400
Unwrought, excluding alloys and waste and scrap, includes cathode and metal powder, may include intermediate products of cobalt metallurgy	do.	9,350	312,000	9,950	302,000
Oxide and hydroxides	do.	1,310	35,100	1,180	29,400
Other forms, includes acetates, carbonates, chlorides, sulfates	do.	2,200	24,800	2,330	24,200
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	do.	1,140,000	3,970,000	1,250,000	7,610,000
Semimanufactures	do.	524,000	1,940,000	512,000	3,240,000
Scrap, alloyed and unalloyed	do.	114,000	276,000	118,000	481,000
Ferroalloys not listed elsewhere:					
Ferrophosphorus	metric tons	12,100	3,940	11,400	6,060
Other	do.	7,500	15,000	7,310	13,700
Gallium:					
Unwrought and waste and scrap	kilograms	15,800	4,900	26,900	8,210
Gallium arsenide wafers, doped and undoped	do.	204,000	163,000	189,000	202,000

See footnotes at end of table.

TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Germanium, wrought, unwrought, waste and scrap, gross weight	do.	16,700	11,200	24,100	17,900
Gold:					
Ores and concentrates	kilograms	1,630	18,900	1,090	12,600
Dore and precipitates	do.	234,000	2,060,000	125,000	1,990,000
Bullion, refined	do.	105,000	1,520,000	136,000	2,550,000
Waste and scrap	do.	27,300	209,000	43,000	448,000
Metal powder	do.	1,990	6,730	1,460	13,600
Compounds	do.	29,500	935	122,000	2,450
Indium, unwrought and waste and scrap	do.	142,000	94,300	100,000	71,400
Iron and steel:					
Steel mill products		29,200	NA	41,100	NA
Fabricated steel products		5,120	NA	5,930	NA
Cast iron and steel products		747 [r]	NA	751	NA
Stainless steel	metric tons	585,000	NA	641,000	NA
Iron and steel scrap:					
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping		3,840	909,000	4,820	1,250,000
Pig iron, all grades		6,030	1,580,000	6,730	1,760,000
Direct-reduced iron, steelmaking grade		2,170	361,000	2,610	417,000
Ships, boats, and other vessels for scrapping		(2)	208	(2)	49
Used rails for rerolling and other uses, includes mixed (used plus new) rails		164	62,800	185	65,600
Iron ore		13,000	532,000	11,500	611,000
Lead:					
Pigs and bars, Pb content	metric tons	298,000	303,000	331,000	413,000
Pigments and compounds, Pb content	do.	32,500	55,500	27,900	55,400
Scrap, reclaimed, includes ash and residues, Pb content	do.	3,340	2,880	1,560	1,650
Wrought, all forms, including wire and powders, gross weight	do.	11,900	28,900	12,100	35,500
Magnesium:					
Waste and scrap, gross weight	do.	14,700	22,700	17,200	23,700
Metal, gross weight	do.	28,700	80,700	31,900	74,900
Alloys, Mg content	do.	40,300	139,000	25,200	88,200
Powder, sheets, tubing, ribbons, wire, other forms, Mg content	do.	1,040	10,100	927	10,100
Manganese:					
Ores and concentrates with 20% or manganese, all grades, Mn content	do.	334,000	58,200	270,000	53,900
Ferromanganese, all grades, Mn content	do.	201,000 [r]	200,000	282,000	275,000
Silicomanganese, Mn content	do.	218,000	231,000	264,000	288,000
Metal, unwrought, other wrought, waste and scrap, gross weight	do.	32,300 [r]	55,900 [r]	32,900	46,700
Chemicals, manganese dioxide and potassium permanganate, gross weight	do.	32,600	41,600	37,700	49,600
Mercury:					
Metal	do.	212	2,530	94	2,320
Amalgams of precious metals whether or not chemically defined	do.	51	89,100	27	115,000
Molybdenum:					
Ores and concentrates, including roasted and other, Mo content	do.	11,900	746,000	10,900	395,000
Chemicals, gross weight:					
Oxides and hydroxides	do.	1,240	42,500	629	24,300
Molybdates, all	do.	2,750 [r]	54,800	915	36,900
Orange	do.	983	4,780	824	5,110
Ferromolybdenum, Mo content	do.	4,050	278,000	3,060	165,000
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight	do.	879	72,900	1,160	75,700
Nickel, Ni content:					
Primary, chemicals and unwrought	metric tons	143,000	2,060,000	153,000	3,190,000
Secondary, stainless steel scrap and waste and scrap	do.	15,500	223,000	20,300	307,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes	do.	1,060	26,000	1,110	29,900
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles	do.	23,300	481,000	27,200	640,000

See footnotes at end of table.

TABLE 8—Continued
U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Niobium (columbium) and tantalum:					
Niobium:					
Ores and concentrates	metric tons	10	118[r]	5	98
Oxide	do.	946	13,400	1,090	15,300
Ferroniobium	do.	8,360	71,700	12,500	114,000
Unwrought, alloys, metal, powder	do.	1,380	26,700	1,450	30,900
Tantalum:					
Ores and concentrates, includes synthetic concentrates	do.	1,250	43,700	1,060	42,300
Unwrought, waste and scrap, powders, alloys, metal	do.	1,170[r]	105,000	798	120,000
Wrought	do.	78	17,100	38	11,200
Platinum-group metals, metal content:					
Platinum, grains and nuggets, sponge, other unwrought, other, waste and scrap, coins	kilograms	106,000	2,280,000	114,000	2,820,000
Palladium, unwrought and other	do.	139,000	855,000	119,000	1,110,000
Iridium, unwrought and other forms	do.	3,010	16,700	2,800	30,100
Osmium, unwrought	do.	39	362	56	487
Ruthenium, unwrought	do.	23,200	49,800	36,000	187,000
Rhodium, unwrought and other forms	do.	13,600	821,000	15,900	1,920,000
Rare earths, estimated equivalent rare-earth oxide (REO) content:					
Cerium compounds, including oxides, hydroxides, nitrates, sulfate chlorides, oxalates	do.	2,170,000	10,600	2,590,000	10,800
Yttrium compounds content by weight greater than 19% but less than 85% oxide equivalent	do.	223,000	3,480	168,000	2,320
Compounds, including oxides, hydroxides, nitrates, other compounds except chloride	do.	8,550,000	59,600	10,600,000	66,300
Mixtures of REO's except cerium oxide	do.	640,000	6,320	1,570,000	8,740
Metals, whether intermixed or alloyed	do.	880,000	4,900	867,000	5,980
Mixtures of rare-earth chlorides, except cerium chloride	do.	2,670,000	6,330	2,750,000	7,670
Ferrocerium and other pyrophoric alloys	do.	130,000	2,050	127,000	2,110
Rhenium:					
Metal	do.	21,800	23,300	22,000	27,800
Ammonium perrhenate	do.	10,300	7,040	24,200	20,500
Selenium and tellurium:					
Selenium, Se content:					
Selenium	do.	575,000	33,900	398,000	18,000
Dioxide	do.	14,100	1,190	15,000	805
Tellurium, Te content	do.	42,200	4,650	31,100	3,630
Silicon, gross weight:					
Ferrosilicon	metric tons	290,000	215,000	327,000	244,000
Metal	do.	157,000	366,000	149,000	394,000
Silver:					
Ash and residues, Ag content	kilograms	2,630	769	4,800	1,110
Bullion, Ag content	do.	3,880,000	902,000	4,280,000	1,520,000
Dore, Ag content	do.	300,000	89,500	286,000	134,000
Metal powder, gross weight	do.	28,400	6,840	30,700	5,690
Nitrate, gross weight	do.	201	30	1,260	255
Ores and concentrates, Ag content	do.	433	318	--	--
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	181,000	39,800	194,000	71,500
Waste and scrap, gross weight	do.	3,640,000	126,000	2,510,000	275,000
Unwrought, other, gross weight	do.	357,000	80,400	259,000	91,300
Thallium, unwrought powders, waste and scrap, other	do.	235	33	530	67
Thorium and thorium-bearing materials, compounds	do.	4,930	145	48,600	1,560
Tin, gross weight:					
Compounds	metric tons	564	5,720	440	4,320
Dross, skimmings, scrap, residues, alloys, n.s.p.f.	do.	9,930	28,500	7,750	34,300
Metal, unwrought	do.	37,500	285,000	43,300	365,000
Miscellaneous, includes tinfoil, tin powder, flitters, metallics, manufactures, n.s.p.f.	do.	NA	8,010	NA	23,000
Tinplate and terneplate	do.	391,000	300,000	495,000	371,000
Tinplate scrap	do.	16,800	3,160	10,300	2,530

See footnotes at end of table.

TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Titanium:					
Concentrate:					
Ilmenite	metric tons	154,000	20,400	187,000	20,100
Rutile, natural and synthetic	do.	366,000	158,000	355,000	162,000
Metal:					
Waste and scrap	do.	12,400	162,000	12,800	200,000
Unwrought	do.	15,800	120,000	24,400	252,000
Ingots	do.	2,450	38,700	3,140	58,800
Billets, bloom, sheet, bar, slab	do.	XX	XX	XX	XX
Powder	do.	126	4,060	152	5,170
Other	do.	1,330	22,900	1,520	35,600
Wrought products and castings, includes bar, castings, foil, pipe, plate, profile, rod, sheet, strip, tube, wire, other	do.	3,660	111,000	5,360	181,000
Ferrotitanium and ferrosilicon titanium	do.	16,900	76,200 [r]	7,080	63,400
Pigment, dioxide and oxide	do.	341,000	578,000	288,000	526,000
Titaniferous iron ore	do.	61,100	3,560	49,800	3,240
Titaniferous slag	do.	667,000	254,000	693,000	276,000
Tungsten, W content:					
Ammonium paratungstate	do.	1,920	29,900	2,900	78,200
Ferrotungsten and ferrosilicon tungsten	do.	385	5,390	265	7,990
Miscellaneous tungsten-bearing materials, metal powders, carbide powder, unwrought, waste and scrap, wrought, oxides, calcium tungstate, other tungstates, other compounds	do.	6,760	164,000	6,540	232,000
Ores and concentrates	do.	2,080	31,400	2,290	49,500
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	1,010	15	102,000	312
Ferrovanadium, V content	do.	11,900,000	131,000	2,140,000	90,500
Metal, including waste and scrap, gross weight	do.	54,800	3,800	121,000	5,270
Miscellaneous chemicals, sulfates and vanadates, V content	do.	85,100	2,800	115,000	3,330
Pentoxide, anhydride, V content	do.	1,370,000	52,900	1,920,000	45,200
Vanadium-bearing ash, residues, slag from the manufacture of iron and steel, V_2O_5 content	do.	3,020,000	12,400	1,780,000	8,450
Other oxides and hydroxides, V content	do.	186,000	6,540	129,000	3,370
Zinc:					
Compounds, chloride, chromates of zinc or of lead, compounds n.s.p.f., lithopone, oxide, sulfate, sulfide, gross weight	metric tons	151,000 [r]	156,000 [r]	179,000	289,000
Ores and concentrates, Zn content	do.	156,000	117,000	383,000	183,000
Rolled	do.	3,630	11,900	2,050	8,250
Slab, refined	do.	668,000	875,000	851,000	2,050,000
Zirconium and hafnium:					
Hafnium, unwrought, including powders	do.	4	931	4	701
Zirconium:					
Ferrozirconium	do.	306	675	197	506
Ores and concentrates	do.	38,200	25,700	36,200	28,600
Oxide, includes germanium oxides and zirconium oxides	do.	3,160	33,300	2,820	39,100
Unwrought powder	do.	269	6,000	213	4,990
Waste and scrap	do.	755	64,900	535	45,700
Total		XX	43,800,000 [r]	XX	60,200,000
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude, ground and refined	do.	244,000	109,000	209,000	99,800
Metallic abrasives	do.	16,500	12,500	19,600	14,400
Silicon carbide, crude, ground and refined	do.	201,000	128,000	185,000	121,000
Asbestos:					
Chrysotile and other unspecified type	do.	2,530	1,420	2,230	1,000
Products with basis of asbestos, cellulose, or other minerals		NA	580,000	NA	599,000

See footnotes at end of table.

TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

		2005		2006	
Mineral or product		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Barite:					
Chemicals; chloride, oxide, hydroxide, peroxide, nitrate, precipitated carbonate	metric tons	14,100	16,600	12,500	16,300
Crude	do.	2,570,000	137,000	2,530,000	145,000
Ground	do.	84,000	8,250	815	137
Other sulfates	do.	28,600	16,000	22,400	15,300
Boron minerals and compounds:					
Borax		1	319	2	701
Boric acid		52	22,500	85	34,900
Colemanite		31	8,900	25	7,260
Ulexite		103	31,000	131	39,200
Bromine:					
Compounds, contained bromine	metric tons	57,400 [r]	53,400 [r]	43,400	79,800
Elemental	do.	2,710	2,300 [r]	807	1,340
Cement, hydraulic and clinker		33,700	1,560,000	35,900	2,550,000
Clays:					
China clay or kaolin		262	40,200	303	55,600
Fire clay		(2)	156	(2)	168
Decolorizing earths and fuller's earth		2	286	3	223
Bentonite		10	3,550	13	3,100
Common blue clay and other ball clay		1	261	1	233
Other clay		8	4,660	5	3,650
Chamotte or dina's earth		(2)	9	(2)	18
Artifically activated clay and activated earth		17 [r]	10,300	21	16,200
Diamond, industrial:					
Diamond stones, natural and miners'	thousand carats	2,120	29,500	2,140	27,400
Powder, dust and grit, natural and synthetic	do.	284,000	77,300	371,000	80,500
Diatomite	metric tons	4,480	1,280	4,480	1,300
Feldspar and nepheline syenite:					
Feldspar	do.	26,200	1,700	5,180	549
Nepheline syenite	do.	340,000	33,800	426,000	36,000
Fluorspar:					
Aluminum fluoride	do.	4,250	4,170	7,950	8,090
Cryolite	do.	3,110	3,260	3,960	3,870
Fluorspar	do.	629,000	122,000	553,000	112,000
Hydrofluoric acid, HF	do.	137,000	138,000	156,000	168,000
Garnet, industrial[e]		42	5,910	51	8,340
Gemstones		XX	17,200,000	XX	18,300,000
Graphite:					
Natural	metric tons	64,500	34,700	52,600	29,100
Electric furnace electrodes	do.	81,200	157,000	98,200	208,000
Gypsum:					
Crude		11,200	114,000 [r]	11,400	130,000
Plasters		7 [r]	4,350	12	5,010
Boards		739	129,000	994	206,000
Other		XX	41,100	XX	60,400
Iodine:					
Crude	metric tons	6,250	104,000 [r]	5,640	109,000
Potassium iodide	do.	458	8,980 [r]	471	12,000
Iron oxide pigments:					
Natural	do.	5,240 [r]	2,610 [r]	6,270	2,890
Synthetic	do.	188,000	138,000	193,000	156,000
Kyanite, andalusite, sillimanite	do.	6,300	2,410	4,350	1,580
Lime		310	33,100 [r]	298	36,300
Lithium chemicals:					
Carbonate	metric tons	18,900	27,500	16,500	38,200
Hydroxide	do.	124	452 [r]	997	6,040

See footnotes at end of table.

TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2005		2006	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Magnesium compounds:					
Compounds, chlorides, hydroxide, peroxide, sulfates	metric tons	119,000	34,800	107,000	35,900
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	152,000	23,900	163,000	23,900
Dead-burned and fused magnesia	do.	478,000	124,000	433,000	108,000
Other magnesia	do.	18,300	11,300	19,000	11,100
Crude	do.	15,000	2,260	15,200	2,550
Mica:					
Scrap and flake:					
Powder	do.	21,400	10,100	27,400	11,000
Waste	do.	900	365	918	434
Sheet:					
Unworked, excludes unworked sheet mica valued at less than $1 per kilogram	do.	44 [r]	81 [r]	355	256
Worked	do.	1,340	12,900	1,420	18,500
Nitrogen, major compounds, gross weight		18,000	4,670,000	16,200	4,550,000
Peat moss	metric tons	891,000	195,000	924,000	223,000
Perlite, processed crude	do.	196,000	7,970	245,000	10,500
Phosphate rock and phosphatic materials		2,730	203,000	2,620	229,000
Potash, chloride, sulfate, nitrate, sodium nitrate mixtures	metric tons	8,110,000	1,170,000	7,380,000	1,150,000
Pumice:					
Crude or unmanufactured		239	31,800	364	11,500
Wholly or partially manufactured		1	5,750	1	3,380
Salt		12,100	180,000	9,490	163,000
Sand and gravel:					
Construction		7,160	86,800	4,960	94,100
Industrial		711	18,200	855	21,000
Silica, special stone products		NA	7,700	NA	8,100
Soda ash		8	2,460	7	2,290
Stone:					
Crushed, chips, calcium carbonate fines, excludes precipitated carbonates		21,000	194,000	19,800	206,000
Dimension		NA	2,180,000	NA	2,500,000
Strontium:					
Carbonate	metric tons	17,900	6,930	13,200	6,440
Celestite	do.	1,820	98	1,530	98
Metal	do.	770	2,210	617	1,820
Nitrate	do.	714	637	1,020	883
Oxide, hydroxide, peroxide	do.	9	38	16	52
Sulfur:					
Elemental		2,820 [e]	70,500	2,950 [e]	70,400
Sulfuric acid, 100% H_2SO_4	metric tons	2,680,000	122,000	2,430,000	90,100
Talc		237	55,600	314	66,700
Vermiculite[e]		91	17,000	65	10,600
Wollastonite[e]	metric tons	6,000	750	2,500	313
Zeolites[e]	do.	--	--	250	50
Total		XX	30,600,000	XX	33,200,000
Grand total		XX	74,400,000 [r]	XX	93,400,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Less than ½ unit.

TABLE 9

WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2002	2003	2004	2005	2006	2006	Percentage of world total
Metals:								
Alumina		55,000	57,900	60,700	63,500	69,200	4,700	6.8
Aluminum[2]		26,100	28,000	29,900	31,900	33,700	2,280	6.8
Antimony	metric tons	118[r]	116[r]	144[r]	142[r]	134	--	--
Arsenic trioxide[3]	do.	62,400[r]	62,200[r]	52,400[r]	52,500	52,700	--	--
Bauxite[3, 4, 5]		144,000	153,000	161,000[r]	172,000[r]	178,000	NA	NA
Beryl[3]	metric tons	2,530[r]	2,680[r]	2,760[r]	3,440	4,480	3,830	85.4
Bismuth, refinery	do.	6,730	8,700[r]	15,200[r]	11,800[r]	12,000	--	--
Cadmium, refinery	do.	17,800[r]	18,700[r]	19,400[r]	19,700[r]	19,300	700	3.6
Chromite[3]		14,600	15,500[r]	17,600[r]	19,000[r]	19,700	--	--
Cobalt, Co content:								
Mine	metric tons	52,200[r]	52,700[r]	58,400[r]	63,500[r]	67,500	--	--
Refinery	do.	40,800	43,800	49,100	54,900	55,000	--	--
Copper:								
Mine		13,600[r]	13,800[r]	14,700	15,000[r]	15,100	1,200	7.9
Smelter		12,600	12,700[r]	12,900	13,600	14,100	501	3.6
Refinery		15,600[r]	15,300	16,000[r]	16,600	17,400	1,250	7.2
Gold	kilograms	2,530[r]	2,560	2,440	2,470	2,460	252	10.2
Indium, refinery	metric tons	406	376	396	496	531	--	--
Iron ore[3]		1,100,000	1,210,000[r]	1,360,000	1,540,000[r]	1,800,000	52,700	2.9
Iron and steel:								
Direct-reduced iron[2]		44,600[r]	47,200[r]	52,600[r]	56,500[r]	59,100	240	0.4
Pig iron[2]		608,000[r]	667,000[r]	711,000[r]	794,000[r]	866,000	37,900	4.4
Raw steel		907,000[r]	974,000[r]	1,060,000	1,140,000[r]	1,230,000	98,200	8.0
Lead:								
Mine, Pb content	metric tons	2,870[r]	3,160[r]	3,170[r]	3,450[r]	3,470	429	12.4
Refinery	do.	6,800[r]	6,980[r]	7,070[r]	7,700[r]	8,030	1,310	16.4
Magnesium[5]	do.	432[r]	509[r]	595	622[r]	689	W	NA
Manganese ore[3]		22,100[r]	24,200[r]	27,900[r]	31,100[r]	33,400	--	--
Mercury[5]	metric tons	1,980[r]	2,120[r]	1,640[r]	1,430[r]	1,480	NA[6]	NA
Molybdenum, Mo content	do.	122,000	131,000	159,000	186,000[r]	185,000	59,800[7]	32.3
Nickel, Ni content:								
Mine	do.	1,350	1,370	1,420[r]	1,500[r]	1,580	--	--
Refinery	do.	1,210[r]	1,230[r]	1,280[r]	1,300	1,350	--	--
Niobium (columbium)-tantalum concentrates[3]	do.	82,600[r]	81,600[r]	67,900[r]	67,700[r]	67,700	--	--
Platinum-group metals	kilograms	433,000[r]	466,000[r]	481,000[r]	510,000[r]	518,000	18,700	3.6
Rhenium	do.	31,600	36,200	42,300	45,900	47,200	8,100	17.2
Selenium[2, 5]	do.	1,410[r]	1,470[r]	1,370[r]	1,430[r]	1,540	W	NA
Silver	metric tons	18,800	18,800	19,900[r]	20,600[r]	20,200	1,140	5.6
Tellurium[2, 5]	kilograms	89	95	124	131[r]	132	W	NA
Tin:								
Mine	metric tons	235[r]	259[r]	301[r]	299[r]	304	--	--
Smelter[8]	do.	280,000[r]	282,000[r]	308,000[r]	344,000[r]	366,000	11,600	3.2
Tungsten, W content	do.	66,200[r]	68,300[r]	102,000[r]	88,200[r]	90,800	--	--
Vanadium	do.	51,000	47,900	51,900	56,400	56,300	--	--
Zinc:								
Mine, Zn content of concentrate and direct shipping ore		8,880[r]	9,520[r]	9,590[r]	9,930[r]	10,000	727	7.3
Smelter		9,840[r]	9,980[r]	10,500[r]	10,400[r]	10,600	269	2.5
Industrial minerals:								
Asbestos	metric tons	2,320	2,440[r]	2,310[r]	2,320[r]	2,300	--	--
Barite	do.	6,160[r]	6,780[r]	7,760[r]	8,110[r]	7,960	589[9]	7.4

See footnotes at end of table.

TABLE 9—Continued

WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

		World total					United States	
Mineral or product		2002	2003	2004	2005	2006	2006	Percentage of world total
Industrial minerals—Continued:								
Boron minerals	do.	4,580 [r]	4,720 [r]	5,070	5,090 [r]	4,260	W	NA
Bromine	do.	503	488	543 [r]	556 [r]	545	243 [9]	44.7
Celesite	metric tons	444 [r]	492 [r]	521 [r]	570 [r]	585	--	--
Cement, hydraulic		1,850,000 [r]	2,030,000	2,190,000	2,350,000 [r]	2,560,000	99,700 [10]	3.9
Clays:								
Bentonite		10,100 [r]	10,300 [r]	11,500	11,600 [r]	11,700	4,940	42.2
Fuller's earth	metric tons	4,030 [r]	4,890 [r]	4,690 [r]	4,160 [r]	3,980	2,540	63.8
Kaolin		35,000 [r]	36,200 [r]	37,600 [r]	38,200 [r]	37,500	7,470	19.9
Diamond:								
Natural	thousand carats	141,000	158,000	163,000 [r]	178,000 [r]	171,000	--	--
Synthetic	do.	529,000	543,000	559,000	563,000	566,000	258,000	45.6
Diatomite	metric tons	1,970 [r]	1,970 [r]	1,940 [r]	2,010 [r]	2,160	799 [9]	37.0
Feldspar		14,100 [r]	14,300 [r]	14,800 [r]	15,100 [r]	15,400	760	5.0
Fluorspar	metric tons	4,450 [r]	4,850 [r]	5,230 [r]	5,280 [r]	5,330	--	--
Graphite, natural	do.	932	999	1,018	1,040 [r]	1,029	--	--
Gypsum		111,000 [r]	114,000 [r]	120,000 [r]	122,000 [r]	125,000	21,100	16.8
Iodine, crude	metric tons	21,000	24,600 [r]	24,800	26,500 [r]	26,600	W	NA
Iron oxide pigments	do.	635	646	604	610	610	W	NA
Kyanite and related minerals	do.	391	386	456	450	452	130 [11]	28.7
Lime		221,000 [r]	236,000 [r]	249,000 [r]	259,000 [r]	271,000	21,000 [9, 10]	7.8
Lithium	metric tons	33,200	12,100	13,700	37,500	30,000	W	NA
Magnesite, crude[5]		14,100 [r]	14,400 [r]	15,100 [r]	14,100 [r]	14,100	W	NA
Mica, including scrap and flake[12]	metric tons	278 [r]	279 [r]	322 [r]	288 [r]	342	110	32.1
Monazite	do.	5,440	5,800	7,410	6,120	6,500	--	--
Nitrogen, N content of ammonia		109,000	110,000	117,000	122,000 [r]	124,000	8,520 [13]	6.9
Peat		26,300 [r]	24,000 [r]	26,100 [r]	25,700 [r]	25,800	551 [14]	2.1
Perlite	metric tons	1,810	1,810	1,860	1,860 [r]	1,810	454 [9]	25.1
Phosphate rock[3]		136,000 [r]	139,000 [r]	143,000 [r]	151,000 [r]	142,000	30,100	21.2
Potash, K_2O equivalent		27,100 [r]	28,600 [r]	31,100 [r]	32,500 [r]	29,100	1,100	3.8
Pumice		16,300 [r]	16,500 [r]	18,900 [r]	18,400 [r]	18,800	1,540 [9]	8.2
Rare earths	metric tons	93,000	97,100	102,000	123,000	123,000	--	--
Salt		214,000 [r]	221,000 [r]	233,000 [r]	246,000 [r]	251,000	44,300 [10]	17.6
Sand and gravel, industrial, silica		113,000	115,000	119,000 [r]	116,000 [r]	117,000	31,700 [9]	27.2
Soda ash, natural and manufactured		37,200	38,400	40,600 [r]	42,000 [r]	42,400	11,000 [15]	25.9
Sulfur, all forms		62,000 [r]	63,500 [r]	65,500 [r]	65,600 [r]	65,700	9,060	13.8
Talc and pyrophyllite[16]	metric tons	8,030 [r]	8,550 [r]	8,760 [r]	8,840 [r]	8,920	895	10.0
Titanium concentrates:[3]								
Ilmenite and leucoxene	do.	5,410 [r]	5,780 [r]	5,940 [r]	6,090 [r]	6,700	500 [17]	7.5
Rutile[5]	do.	446	361	353 [r]	373 [r]	511	(18)	NA
Vermiculite	do.	497	491	513 [r]	521 [r]	518	100	19.3
Zirconium	do.	973	1,030	1,080	1,090	1,180	W	NA

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "World" total. -- Zero.

[1] Data are rounded to no more than three significant digits.

[2] Primary.

[3] Gross weight.

[4] Individual country figures that are included in the world total represent dried bauxite equivalent of crude ore, but for some countries available data are insufficient to permit this adjustment.

[5] "World total" for years listed does not include U.S. production.

[6] U.S. production of mercury is byproduct only.

[7] Listed in Molybdenum chapter (table 1) as production.

TABLE 9—Continued

WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

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[8] Includes tin content of alloys made directly from ore.

[9] Quantity sold or used by producers.

[10] Includes Puerto Rico. Masonary cement and Portland cement only.

[11] Includes synthetic mullite.

[12] Excludes, if any, U.S. production of low-quality sericite and sheet mica.

[13] Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

[14] Horticultural use.

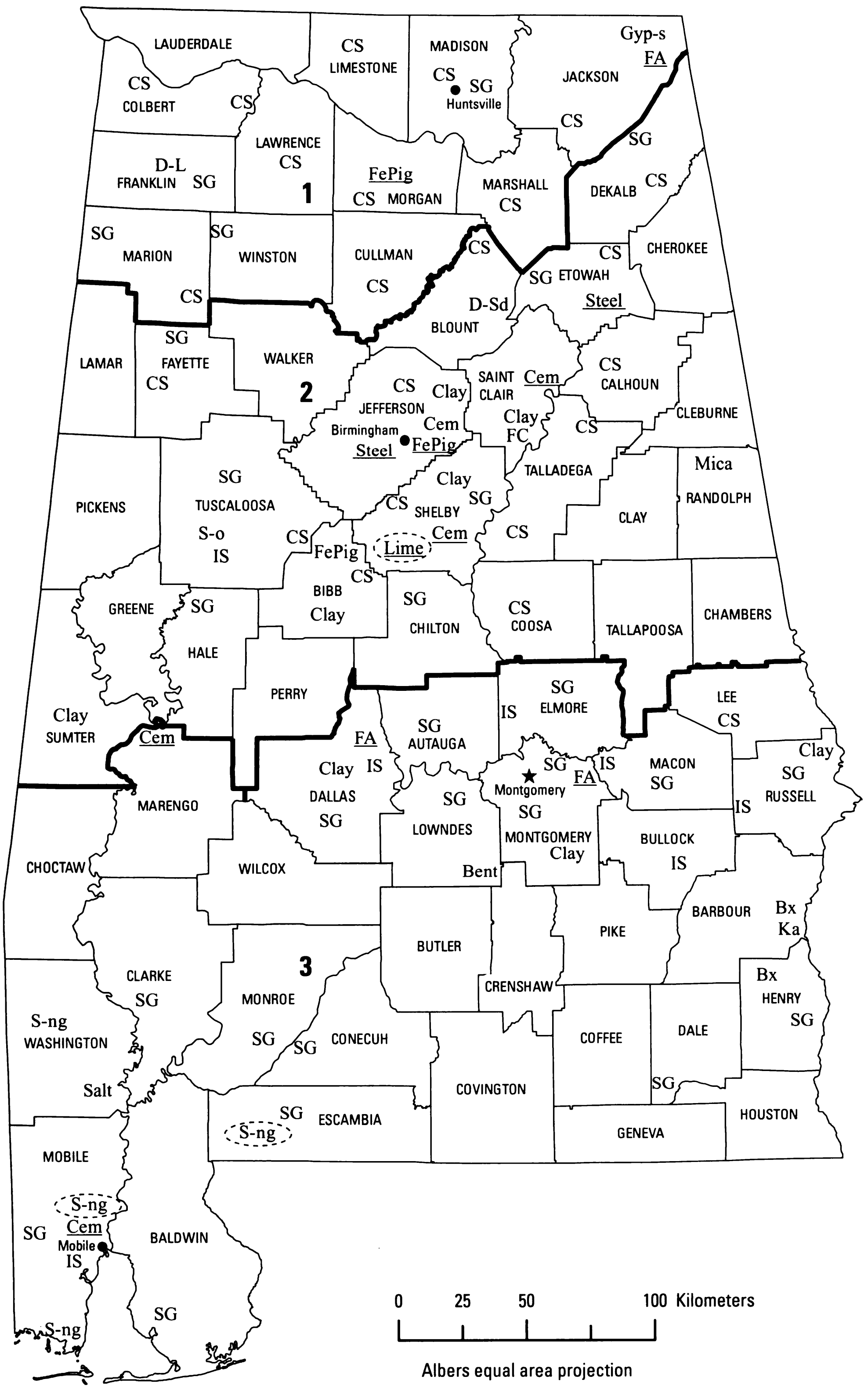
[15] U.S. production is natural only.

[16] Data for the United States exclude proprietary pyrophyllite production.

[17] Includes rutile to avoid disclosing company proprietary data. Rounded to one significant digit.

[18] Included with ilmenite to avoid disclosing company proprietary data; not included in "Total."

ALABAMA



Albers equal area projection

LEGEND

——	County boundary
★	Capital
●	City
1——	Crushed stone/sand and and gravel district boundary

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bx	Bauxite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Gyp-s	Synthetic gypsum
IS	Industrial sand
Ka	Kaolin
Lime	Lime plant
Mica	Mica
Salt	Salt
SG	Construction sand and gravel
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Steel	Steel plant
◌	Concentration of mineral operations

Source: Geological Survey of Alabama/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ALABAMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 2006, Alabama's nonfuel mineral production[1] was valued at $1.36 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $230 million, or more than 20%, increase compared with that of 2005, following a 17% increase from 2004 to 2005. The State rose in rank to 16th from 20th among the 50 States in total nonfuel mineral production value and accounted for more than 2% of the U.S. total.

The top four nonfuel mineral commodities produced in Alabama in 2006 continued to be, in descending order of value, cement (portland and masonry), crushed stone, lime, and construction sand and gravel. These four commodities accounted for nearly 90% of the State's total nonfuel mineral production value; the combined value of cement and crushed stone represented 66% of the total. Most of Alabama's nonfuel minerals increased in production value in 2006. Leading in the State's rise in value were increases in the values of cement (portland and masonry), salt, lime, crushed stone, and construction sand and gravel, up by about $59 million, more than $44 million, $43 million, $36 million, and nearly $26 million, respectively (table 1). Smaller increases took place in common clays, up by $10 million, and industrial sand and gravel, up by $7.5 million. Comparatively smaller decreases in value took place in the mineral commodities of crude iron oxide pigments, kaolin, and crude mica.

Alabama increased in State ranking in the quantities of many of the nonfuel mineral commodities that were produced in the State. The State rose to second from third in the production of lime, to second from third in iron oxide pigments of three producing States, to third from fourth in bentonite clay, to fifth in fire clay following no production in 2005, and to sixth from ninth in gemstones (gemstones based upon value). Alabama continued to be fourth in the production of masonry cement, seventh in portland cement, and eighth in salt; and it was the producer of substantial quantities of, in descending order of value, crushed stone and construction sand and gravel. Decreases in rank took place in the production of common clay and mica, to third from second in each, and in that of kaolin clay, to fourth from third. All metal production in the State, especially that of raw steel, was the result of the processing of materials acquired from other domestic and foreign sources. Production of a natural mixture of bauxite (no longer used to produce primary aluminum) and bauxitic clay with very low iron oxide content has been reported to the USGS since 1995 as kaolin; it is primarily used to make refractory products.

The narrative information that follows was provided by the Geological Survey of Alabama[2] (GSA).

Exploration and Development

Mineral exploration in Alabama continued to focus on industrial mineral resources, with several large expansions of operations taking place in the State (including brick operations, calcium carbonate, cement, crushed stone, and refractory clay).

Commodity Review

Industrial Minerals

In 2006, 218 companies or operations were involved in the mining and production of industrial mineral resources in Alabama. This included 53 limestone-dolomite operations for crushed stone that were active in the State. In addition, granite, sandstone, marble, and quartzite operations for crushed stone were active in the State.

The GSA reported another year of record crushed stone production for the State with more than 54 million metric tons (60 million short tons) produced in the State. Birmingham-based Vulcan Materials Co. remained the leading construction aggregate producer in the country. Marble operations were active for the production of micronized calcium carbonate and building stone. Alabama had 30 active clay (bentonite, common clay, fire clay, fuller's earth, kaolin, and shale) operations. Clay production was led by common clay followed by shale, fuller's earth, bentonite, fire clay, and kaolin.

In 2006, 123 sand and gravel operations (including both construction and industrial operations) were active in the State. Sand and gravel production came primarily from alluvium and terrace deposits in Elmore, Macon, Montgomery, Russell, and Tuscaloosa Counties and from the Citronelle Formation in Mobile County.

Other industrial mineral operations included bauxitic clays, building stone (limestone and sandstone), cement, chalk, recovered sulfur, salt (solution recovery), and silicon.

Government Activities and Programs

The Alabama Department of Transportation (ADOT) has an annual maintenance and construction program for nearly 18,000 kilometers of highway. This work represents one of the largest uses of asphaltic and bituminous base, concrete, and stone and gravel aggregate in the State. A revised listing of approved sources of coarse and fine aggregates is available from the ADOT (Alabama Department of Transportation, 2007, p. 2–67).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Lewis S. Dean, a Geologist in the Geologic Investigations Program at the Geological Survey of Alabama, authored the text of the State mineral industry information provided by that agency.

In 2006, the GSA continued to publish 1:24,000–scale geologic maps in Alabama in conjunction with the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

Alabama's geologic map information is used in a variety of ways especially in the rapidly urbanizing portions of the State. For example, geologic mapping aids in the identification of supplies of industrial mineral resources (sand, gravel, and crushed stone) that support construction and infrastructure development. Published geologic 7.5–minute quadrangles during 2006 included the Birmingham North, Cahaba Heights, Cottondale, Greenwood, and McCalla quads in the Jefferson, the Shelby, and the Tuscaloosa County areas of the Valley and Ridge geologic province.

More information on geology, hydrology, mineral occurrence, mining history, and general economics of specific mineral resources in Alabama is available from the Geological Survey of Alabama. Much of this information and GSA contact information is available over the Internet at http://www.gsa.state.al.us.

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Alabama Department of Transportation, 2007, List I – 1 Sources of course and fine aggregates: Alabama Department of Transportation, 68 p. (Accessed July 21, 2008, at http://www.dot.state.al.us/NR/rdonlyres/63C54970-7695-4DFD-8582-E574DDFA7153/0/Li01.pdf.)

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN ALABAMA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	430	49,400 [e]	475	54,800 [e]	526	66,500 [e]
Portland	4,800	320,000 [e]	5,120	421,000 [e]	5,200	468,000 [e]
Clays:						
Bentonite	100	3,050	109	W	W	W
Common	2,120	29,600	2,280	29,000	2,210	38,800
Gemstones, natural	NA	356	NA	371	NA	398
Lime	2,280	164,000	2,240	181,000	2,450	224,000
Sand and gravel:						
Construction	14,700	65,300	15,700	70,500	20,100	96,000
Industrial	643	9,800	710	11,200	474	18,700
Stone:						
Crushed	47,800	296,000	50,300 [r]	329,000 [r]	55,400	365,000
Dimension	W	W	W	W	4	3,630
Combined values of clays (fire, kaolin), iron oxide pigments (crude), mica [crude (2005–06)], salt, stone [dimension (2004–05) marble and sandstone], and values indicated by the symbol W	XX	27,000	XX	30,500 [r]	XX	76,000
Total	XX	965,000	XX	1,130,000 [r]	XX	1,360,000

[e] Estimated. [r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

ALABAMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	51	41,400 r	$269,000	52	44,300	$293,000
Dolomite	3	1,990	14,400	3	2,120	14,500
Marble	2	2,750	18,200	2	2,640	16,400
Sandstone	9 r	1,680 r	10,500 r	9	1,980	12,300
Granite	2	1,830	12,600	2	1,620	11,100
Slate	2	561	3,650	2	481	2,990
Miscellaneous stone	3	50	436	3	2,240	14,500
Total	XX	50,300 r	329,000 r	XX	55,400	365,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	160	1,230
Filter stone	W	W
Other coarse aggregate	978	8,360
Total	1,140	9,590
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,680	11,700
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	7,850	56,000
Total	11,800	83,300
Fine aggregate (-⅜ inch):		
Stone sand, concrete	151	973
Stone sand, bituminous mix or seal	520	3,340
Screening, undesignated	(3)	(3)
Other fine aggregate	2,550	16,000
Total	3,220	20,300
Coarse and fine aggregates:		
Graded road base or subbase	1,700	10,200
Unpaved road surface	138	960
Crusher run or fill or waste	163	1,130
Roofing granules	(4)	(4)
Other coarse and fine aggregates	7,460	51,800
Total	9,460	64,000
Other construction materials	528	3,850
Agricultural, limestone	(5)	(5)
Chemical and metallurgical:		
Cement manufacture	(5)	(5)
Lime manufacture	(5)	(5)
Unspecified:[6]		
Reported	12,700	82,500
Estimated	14,000	84,000
Total	26,200	166,000
Grand total	55,400	365,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data, included in "Total."

[3] Withheld to avoid disclosing company proprietary data, included with "Other fine aggregate."

[4] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6] Reported and estimated production without a breakdown by end use.

TABLE 4
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	6,550	45,500	W	W
Fine aggregate (-⅜ inch)[4]	W	W	1,910	11,400	W	W
Coarse and fine aggregates[5]	5,060	31,600	W	W	W	W
Other construction materials	510	3,450	18	400	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Unspecified:[8]						
Reported	167	1,070	7,230	47,300	5,260	34,200
Estimated	2,200	14,000	10,000	63,000	1,200	7,200
Total	14,900	98,300	33,000	211,000	7,430	55,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes riprap and jetty stone, filter stone, and other coarse aggregates.

[3] Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surface, and other coarse and fine aggregates.

[6] Includes agricultural limestone.

[7] Includes cement and lime manufacture.

[8] Reported and estimated production without a breakdown by end use.

TABLE 5
ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	7,640	$34,900	$4.57
Asphaltic concrete aggregates and road base materials	1,340	9,600	7.14
Road and other stabilization (lime)	19	131	6.94
Fill	1,400	3,360	2.41
Other miscellaneous uses[3]	174	1,490	8.58
Unspecified:[4]			
Reported	2,340	12,800	5.50
Estimated	7,160	33,600	4.69
Total or average	20,100	96,000	4.78

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes snow and ice control, railroad ballast, filtration, and golf course.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,200	6,940	683	3,340	5,760	24,700
Asphaltic concrete aggregates and road base materials	W	W	125	378	W	W
Road and other stabilization (lime)	--	--	--	--	19	131
Fill	9	26	13	50	1,370	3,280
Other miscellaneous uses[3]	96	520	168	1,430	1,130	8,760
Unspecified:[4]						
Reported	94	467	8	35	2,230	12,300
Estimated	237	1,110	452	2,160	6,470	30,300
Total	1,630	9,060	1,450	7,390	17,000	79,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

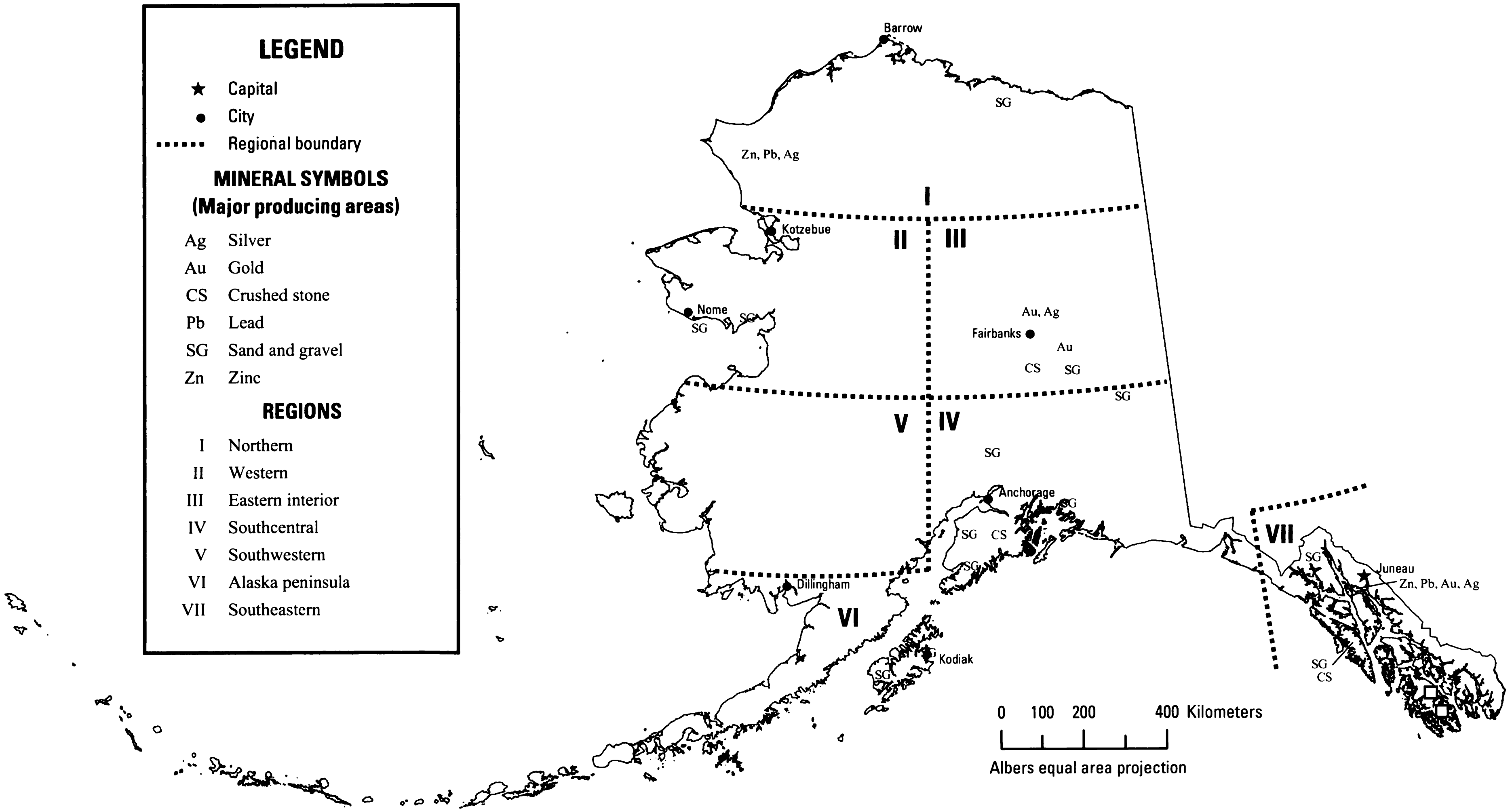
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes snow and ice control, railroad ballast, filtration, and golf course.

[4] Reported and estimated production without a breakdown by end use.

ALASKA



Source: Alaska Division of Geological and Geophysical Surveys//U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ALASKA

In 2006, Alaska's nonfuel raw mineral production[1] was valued at $3.01 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $1.51 billion, or a 101% increase, from the State's total nonfuel mineral value for 2005, which increased $230 million, or more than 18% from that of 2004. The State rose in rank to 6th from 13th among the 50 States in total nonfuel mineral production value and accounted for about 4.5% of the U.S. total value. Yet, per capita, the State led the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 670,000, the value of production was about $4,490 per capita.

During 2006, metallic minerals accounted for more than 97% of the total value of Alaska's nonfuel mineral production. Nearly all the metals value was the result of zinc, lead, gold, and silver production (in descending order of value) from Teck Cominco Alaska Inc.'s Red Dog Mine near Kotzebue in northwestern Alaska and the Greens Creek Mine (a joint venture of Kennecott Minerals Co. and Hecla Mining Co.) in southeastern Alaska southwest of Juneau; most of the State's gold was produced from Kinross Gold Corp.'s Fort Knox Mine near Fairbanks in east central Alaska, the Pogo Mine in interior Alaska near Delta, and the Greens Creek Mine. Nearly all other gold production was from placer gold resources.

Although zinc production decreased slightly from that of 2005 owing to a substantial increase in the mineral commodity's average unit value, its total value more than doubled, the increase being about $1.2 billion. Significant increases in the production of gold and of lead resulted in increases of about $150 million and about $75 million, respectively. Although silver production increased only slightly, its value rose substantially. The only decreases in value took place in construction aggregates. A 13% decrease in construction sand and gravel production led to a slightly more than $12 million, or 15%, decrease in the commodity's value and a 63% decrease in crushed stone production resulted in a nearly $9 million, or 54%, decrease in its value (table 1).

In 2006, Alaska continued to rank first in the production of zinc and silver, while producing significantly more than 15 times and more than 2 times, respectively, the quantities of those metal mineral commodities of the next highest producing States. The State also remained second in the production of lead, third of 10 gold-producing States, and the producer of significant quantities of construction sand and gravel.

Production of peat in Alaska was not reported to the USGS, partly because of reporting difficulties associated with the seasonal, intermittent nature of peat mining in the State. The Alaska Department of Natural Resources (ADNR), Division of Geological and Geophysical Surveys (DGGS), estimated peat production to be about 50,800 cubic meters, valued at about $1.06 million; this was an increase from 47,800 cubic meters produced in 2005, valued at about $810,000 (Szumigala and Hughes, 2007, p. 31).

The DGGS in cooperation with the Alaska Department of Commerce, Community and Economic Development, Office of Economic Development and Minerals, provided the following narrative information;[2] the data, as provided, are based on DGGS surveys and estimates and may differ from USGS production figures as reported to and estimated by the USGS.

Exploration, Development, and Drilling Activities

Exploration expenditures in Alaska during 2006 were about $179 million, 72% more than in 2005 (Szumigala and Hughes, 2007, p. 4). Most of the exploration expenditures were directed toward porphyry copper-gold deposits (38%) and intrusion-related gold deposits (37%), with approximately 12% spent on various gold-quartz vein deposits, 11% on polymetallic massive-sulfide deposits, 1% on platinum-group-metal ultramafic deposits, and the remainder on other deposits. There were 26 projects in Alaska that had exploration expenditures of at least $1 million, and an additional 40 projects expended $100,000 or more. Exploration projects were conducted across the entire State, although nearly 69% of expenditures was directed toward projects in southwestern Alaska. The leading exploration project was Northern Dynasty Minerals Ltd.'s Pebble project on the north side of Lake Iliamna in southwestern Alaska. The project consists of 1,331 State mining claims over copper-gold-molybdenum porphyry mineralization containing principally chalcopyrite, molybdenite, and pyrite. Northern Dynasty completed nearly 23,000 meters (m) of drilling at Pebble in 2006. Estimated inferred mineral resources at the newly defined Pebble East deposit was 3.4 billion metric tons grading 0.57% copper, 0.36 grams per metric ton (g/t) gold, and 0.036% molybdenum. Advanced exploration was also conducted at the Donlin Creek gold project near Aniak in southwestern Alaska. Barrick Gold Corp. continued an extensive drill program at Donlin Creek in 2006, proceeding toward an anticipated completion of a feasibility study in November 2007. Joint-venture partners with Barrick were Calista Corp., Kuskokwim Corp., and NovaGold Resources Inc. Drill results released for the Acma and Lewis areas by NovaGold indicated intersection of 99 mineralized intervals totaling 1,250 m at gold levels ranging from 2.7 to 7.9 g/t (Szumigala and Hughes, 2007, p. 17–19).

Development investment increased to approximately $495.7 million in 2006, a 42.5% increase compared with the $347.9 million spent in 2005, and more than double the $209.1

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Lisa A. Harbo, Development Specialist II, Alaska Department of Commerce, Community and Economic Development, Office of Economic Development and Minerals, authored the text of the State mineral industry information as derived from Alaska's Minerals Industry 2006 Special Report 61 (Szumigala and Hughes, 2007).

million spent in 2004. The increase was mainly the result of the continuation of construction projects at three mining sites, the initiation of construction at another site, and significant additional investments in three operating mines and a limestone quarry.

In the Eastern Interior region, construction at the Pogo Mine near Delta was the dominant project, with capital expenditures of $190.7 million in 2006. Total development expenditure in this region was $249.9 million, down slightly compared with that spent in 2005. The Pogo Mine, located 145 kilometers (km) southeast of Fairbanks, was commissioned in June, but capitalized expenditures continued in order to bring the operation up to its intended mining and ore treatment rates. Teck Pogo, operator of the mine, is a wholly owned subsidiary of Teck Cominco Ltd., which owns a 40% interest in the mine along with Sumitomo Metal Mining Co. (51%) and Sumitomo Corp. (9%).

Also, in the Eastern Interior region, Fairbanks Gold Mining Inc. (wholly owned subsidiary of Kinross Gold Corp.) continued advanced stripping of waste at the Fort Knox open pit gold mine. Studies were undertaken to evaluate the use of the valley heap-leaching method in the treatment of low-grade gold ores from the Fort Knox site.

In the Southeastern region, development expenditures totaled $148.1 million, the second highest level in the State in 2006 and nearly triple the 2005 amount. Construction at Coeur Alaska Inc.'s Kensington underground gold mine in southeastern Alaska continued through 2006. Efforts included construction of the mill and supporting surface facilities and further development of the underground mining operations. Expenditures for development at the Kensington site totaled $121.6 million in 2006.

Kennecott Greens Creek Mining Co. undertook underground development and surface facility improvements at its Greens Creek Mine on Admiralty Island, about 32 km west of Juneau. Expenditures were also made to install infrastructure to augment the mine's diesel-generated power with less expensive hydroelectric power. A project also continued to expand the tailings facility. Reserves at Greens Creek at yearend were approximately 7 million metric tons (Mt), grading 3.8 g/t gold, 494 g/t silver, 10.4% zinc, and 4.0% lead.

Select Resources Corp. (a subsidiary of Tri-Valley Corp.) began limited development at the Calder limestone deposit on Prince of Wales Island. The deposit contains 12.6 Mt of proven and probable reserves, a significant portion of which was estimated to be of high chemical grade for use in paper, plastics, paints, and other applications. The current mining area covers about 3% of the 230 hectares (ha) of patented mining area.

In the Northern region, Teck Cominco Alaska Inc. carried out capitalized maintenance and natural gas development programs at its Red Dog zinc-lead mine near Kotzebue, and spent an estimated $31.2 million on these programs. The development of a natural gas resource was intended to replace the electric power now generated by diesel-driven internal combustion engines. Use of natural gas would provide a nearby source of environmentally clean energy resulting in significant economic returns to the operation. The natural gas development program was expected to continue in 2007. Red Dog's proven and probable reserves at yearend were 68.7 Mt containing 17.5% zinc and 4.6% lead.

In the Western region, NovaGold Resources Inc. received permits and commenced construction in August at its Rock Creek gold project on the Seward Peninsula. NovaGold also completed a resource update for its Big Hurrah, Rock Creek, and Nome Gold projects. Completion of construction at Rock Creek was anticipated in 2007. The company planned to operate Big Hurrah and Rock Creek concurrently, but at different mining rates, to provide a blended mill feed. The development of the Rock Creek deposit was envisioned as part of an integrated operation that includes the Big Hurrah, Nome Gold, and Saddle deposits. Collectively, these four deposits contain an estimated 88,600 kilograms (kg) of gold.

St. Andrew Goldfields Ltd. continued development of the underground mining operation, and initiated a mill upgrade at its Nixon Fork gold-copper mine in west central Alaska. Mill and facility upgrading were begun in May and continued to near completion at yearend. Underground access and stope construction were carried out with some ore being mined and stockpiled awaiting commissioning of the mill. The Nixon Fork operation was expected to produce about 1,240 kilograms per year of gold (Szumigala and Hughes, 2007, p. 24–31).

Major drilling programs were conducted in most areas of the State during the year. The most extensive programs were conducted by Barrick Gold Inc. at the Donlin Creek property, Northern Dynasty Minerals Ltd. at the Pebble property, TNR Gold Corp. at the Shotgun property, and Tonogold Resources Inc. in the Nyac area. Drilling programs in southeastern Alaska were conducted by Kennecott Greens Creek Mining Co. with surface and underground drilling at the Greens Creek Mine, by Coeur Alaska Inc. at the Kensington and Julian properties, and by Niblack Mining Corp. on the Niblack property. A major drilling program also was conducted in the eastern Interior region by Teck Pogo Inc. on the Pogo property in the Goodpaster mining district. Little Squaw Mining Co. conducted a large reverse-circulation drilling program in the Chandalar area. Triex Minerals Corp. drilled the Boulder Creek uranium property on the Seward Peninsula. In south central Alaska, major drilling programs were conducted by Full Metal Minerals Ltd. at the Lucky Shot property, by Kennecott Exploration Co. at the Whistler property, and by Anglo American plc on the MAN property. International Tower Hill Mines Ltd. drilled at several properties including the LMS and Terra projects. NovaGold drilled at the Arctic, Big Hurrah, Khotol, and Rock Creek properties in the northern and western regions. St. Andrew Goldfields/Mystery Creek Resources Inc. continued underground drilling at the Nixon Fork property. Total drilling length increased 31% in 2006 compared with that of 2005, consistent with the overall increases in exploration activity and expenditures (Szumigala and Hughes, 2007, p. 47–48).

Commodity Review

The production estimates in this report were compiled from DGGS questionnaires and telephone interviews of Alaskan Native corporations, agencies, and municipalities (Szumigala and Hughes, 2007, p. 2). Production data were collected on metals (gold, lead, silver, and zinc), industrial minerals (sand and gravel and stone, crushed), and coal and peat. Total minerals industry employment in 2006 was estimated to be 3,523 full-time-equivalent positions, an increase of 702 full-time-equivalent positions compared with that estimated in 2005 (Szumigala and Hughes, 2007, p. 2).

Industrial Minerals

Sand and Gravel, Construction and Stone, Crushed.—Production of crushed stone decreased to 2.2 Mt in 2006, down 14% compared with that of production in 2005. Sand and gravel production decreased to 8.4 Mt in 2006, a decline of nearly 44% compared with that of 2005. The data reflect some shortfall in reporting, as well as curtailments or reductions in production (Szumigala and Hughes, 2007, p. 31).

Metals

Gold.—Fairbanks Gold Mining operated the Fort Knox Mine in 2006. The company produced 10,369 kg of gold during the year, up 126 kg compared with that produced in 2005. Ore production decreased by about 6% to an average of 30,800 metric tons per day (t/d) from an average of 32,800 t/d in 2005. The decrease was attributed to mining at greater depths in the open pit mine that required longer and steeper haul routes to transport the recovered ore. Total mined material for 2006 was 46.3 Mt, which included 31.7 Mt of stripped waste material. Employment at the Fort Knox Mine for the year averaged 406 persons.

The Pogo Mine was considered essentially to have been in the development phase in 2006. However, approximately 406,000 metric tons (t) of ore was mined. Treatment of about 307,000 t of the mined material resulted in the recovery of nearly 3,530 kg of gold.

Hard-rock (lode) gold production in the State totaled about 15,860 kg, an increase of nearly 27% compared with that produced in 2005. The increase in hard rock production was owing to higher output from the Fort Knox Mine and to new production from the Pogo Mine. Placer gold production increased to just under 1,880 kg in 2006, about a 140% increase compared with that produced in 2005.

Lead, Silver, and Zinc.—The Red Dog Mine accounted for nearly 59% of the annual production value of Alaska's mineral industry in 2006. Milling of ore from the Red Dog Mine totaled 3.24 Mt in 2006, a 5% increase compared with that milled in 2005. Ore grade for 2006 was 20.6% zinc and 6.1% lead compared with an ore grade of 21.7% zinc and 5.6% lead in 2005. As a result, production of zinc in concentrate declined by about 2% to 557,500 t in 2006, and production of lead in concentrate increased by nearly 21% to 123,500 t in 2006 compared with production in 2005. Silver production from the Red Dog Mine was 237,000 kg in 2006. The mine is 100% owned and operated by Teck Cominco Alaska Inc. under a development agreement with NANA Regional Corporation, Inc. (an Alaskan Native corporation) and is located in the DeLong Mountains of Alaska's Brooks Range, a remote site that lies approximately 144 km north of Kotzebue and 88 km from the Chukchi Sea.

The Greens Creek Mine produced a silver-gold dore and sulfide concentrates that contained zinc and lead. In 2006, about 664,000 t of ore was milled compared with 651,000 t in 2005. Metal production from the milled ore totaled approximately1,960 kg of gold, 19,000 t of lead, 276,000 kg of silver, and 53,900 t of zinc (Szumigala and Hughes, 2007, p. 31–46).

Government Programs, Activities, Awards

The Alaska DGGS continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Geologists from the DGGS mapped and sampled 798 square kilometers (km^2) of the Bear River, Bluff, and Casadepaga River areas of the southern Seward Peninsula. A 1:50,000-scale geologic map of the area was expected to be available in spring 2008.

The State of Alaska, through DGGS, funded and acquired airborne magnetic and electromagnetic geophysical surveys for 1,588 km^2 in a highly prospective area for base-metal and gold deposits in the Bonnifield mining district. In January 2006, DGGS released the geophysical data and maps for four areas of Interior Alaska that included Black Mountain, East Richardson, Liscum, and Northeast Fairbanks.

DGGS also released airborne geophysical survey data for a 7,886-km^2 area along the Alaska Highway from Delta Junction to the Canada border. This area may include future development such as a natural gas pipeline, a railroad extension, or other infrastructure. The digital and paper copy release includes total field aeromagnetic and electromagnetic data. The DGGS Geologic Materials Center also received samples and data during the year, including geologic logs and assays from drill holes completed in 1981 and 1982 at the Coal Creek tin property in the Talkeetna Mountains Quadrangle.

The U.S. Bureau of Land Management (BLM) and DGGS made preparations for conducting aeromagnetic and electromagnetic surveys for federal lands in the Fortymile mining district of east central Alaska. The survey is funded by BLM through a cooperative agreement with DGGS in support of DGGS's statewide airborne geophysical survey program.

The USGS contracted for an aeromagnetic survey of the Dillingham Quadrangle and released the data in mid-2006. The USGS continued fieldwork in the Taylor Mountains Quadrangle of southwestern Alaska, with geologic mapping conducted in the southeastern corner of the quadrangle and stream-sediment sampling concentrated in the western quarter of the quadrangle.

The ADNR's abandoned mine land program completed a $3.5 million-phase 2 reclamation project at the Jonesville Mine. Coal fires burning as much as 21 m underground were extinguished, a clay cap was installed, and a 10.5-hectare parcel was landscaped.

In June, the State formally applied to the U.S. Environmental Protection Agency (EPA) for authority to administer the National Pollutant Discharge Elimination System (NPDES) program for wastewater discharges in Alaska. The EPA provided an extensive list of comments on the Alaska Department of Environmental Conservation's (DEC)'s application in October and met with DEC staff in November. DEC planned to resubmit the NPDES program authorization application to EPA by June 15, 2007.

The BLM 2006 Hardrock Mineral Community Outreach and Economic Security Award was presented to Coeur Alaska for its work on the Kensington Project. GeoQuest and Chicken Gold Co. representatives received the Small Operator Award. State reclamation awards for 2006 were presented to EarthMovers of Fairbanks Inc., Golderado Mining Co., Nyac Mining Co., and Usibelli Coal Mine Inc. by the ADNR. Anchorage Sand & Gravel Co. Inc. (AS&G) was awarded the 15th annual Made in Alaska Manufacturer of the Year Award. AS&G is one of the oldest companies in Alaska, getting its start along the banks of Ship Creek in Anchorage in 1938.

The Alaska Industrial Development and Export Authority (AIDEA) conducted negotiations with Sherwood Copper Corp. for the use of the Skagway Ore Terminal to handle shipments of Sherwood's production from a proposed copper-gold mine near Minto in the Yukon Territory. AIDEA and the U.S. Army Corps of Engineers (USACE) investigated the feasibility of the USACE participation in dredging and maintenance of the DeLong Mountain Terminal Port in northwestern Alaska as a regional deepwater port.

The State Governor officially opened the new Glacier Creek Road near Nome in July. The 6-km road was the first project in the Alaska Department of Transportation and Public Facilities' "Roads to Resources" initiative. The road will allow access to the Rock Creek gold project from the Nome-Teller Highway eliminating the need to use the antiquated, winding Anvil Creek Road (Szumigala and Hughes, 2007, p. 49–54).

Reference Cited

Szumigala, D.J., and Hughes, R.A., 2007, Alaska's mineral industry 2006: Alaska Division of Geological & Geophysical Surveys Special Report 61, 83 p. (Accessed March 11, 2009, at http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=15860.)

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN ALASKA[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	12	NA	12	NA	13
Sand and gravel, construction	9,430	51,600	15,100 [r]	80,600 [r]	13,200	68,400
Stone, crushed	2,270	14,200	2,430 [r]	16,000 [r]	893 [3]	7,330 [3]
Combined values of cadmium (byproduct of zinc concentrates),[4] gold, lead, silver, stone [crushed limestone (2006)], zinc	XX	1,200,000	XX	1,410,000	XX	2,930,000
Total	XX	1,270,000	XX	1,500,000	XX	3,010,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

[4] Data not available for 2006.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND[1, 2]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	--	--	--	1	W	W
Granite	3	120	$1,100	4	136	$1,400
Traprock	2	(3)	(3)	1	53	525
Shell	1	(3)	(3)	--	--	--
Miscellaneous stone	10 [r]	2,210 [r]	14,000 [r]	9	705	5,400
Total	XX	2,430 [r]	16,000 [r]	XX	894	7,330

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

[3] Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1, 2]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	21	277
Filter stone	W	W
Coarse aggregate, graded, concrete aggregate (coarse)	W	W
Fine aggregate (-⅜ inch), other	10	130
Coarse and fine aggregates:		
Graded road base or subbase	(3)	(3)
Unpaved road surfacing	(3)	(3)
Terrazzo and exposed aggregate	(3)	(3)
Crusher run or fill or waste	(3)	(3)
Other coarse and fine aggregates	94	800
Total	144	1,297
Unspecified:[4]		
Reported	396	2,610
Estimated	320	3,000
Total	715	5,580
Grand total	893	7,330

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

[3] Withheld to avoid disclosing company proprietary data; included in "Total."

[4] Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

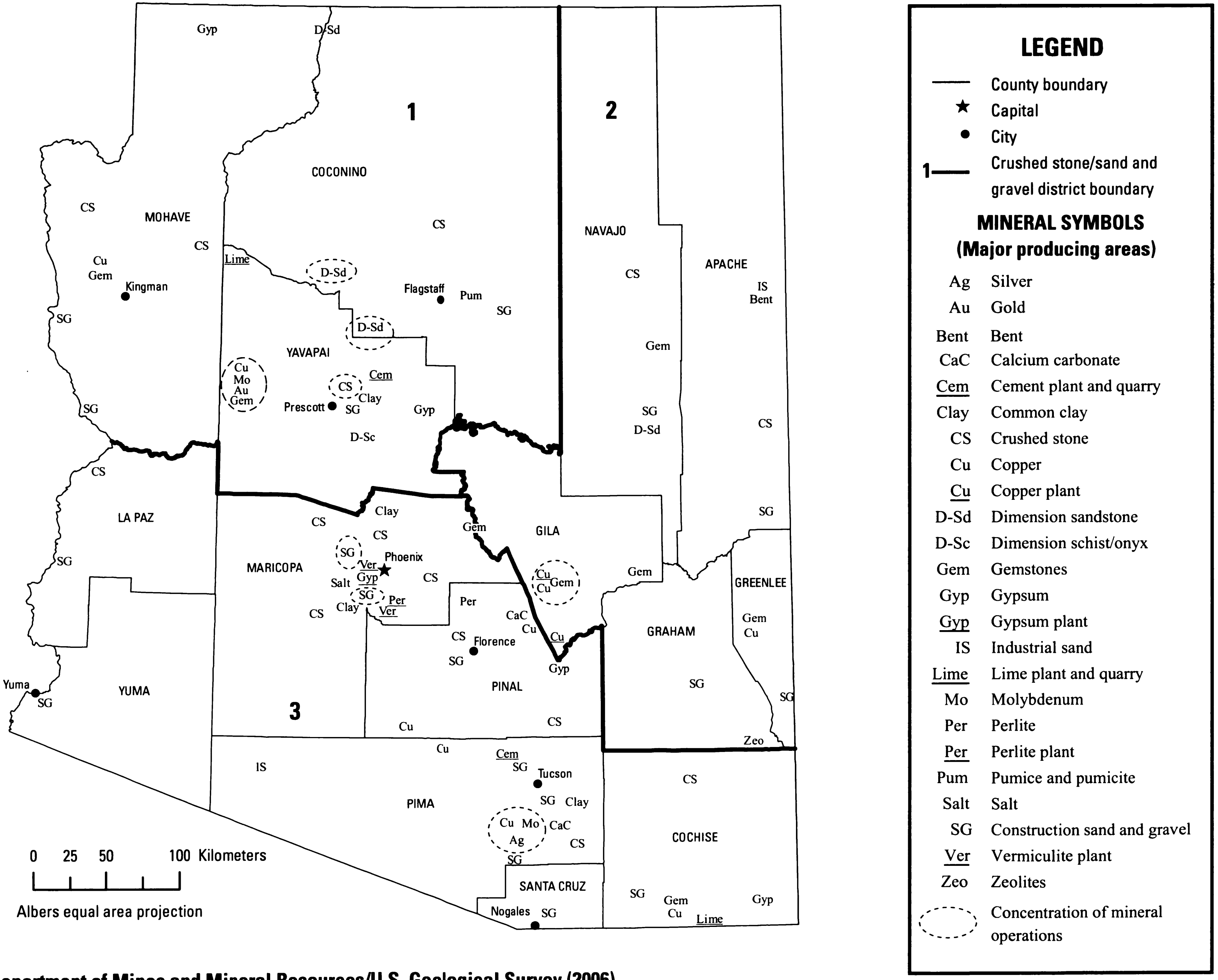
Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,430	$9,700	$6.81
Asphaltic concrete aggregates and other bituminous mixtures	366	3,600	9.84
Road base and coverings	1,130	5,400	4.78
Fill	1,250	3,110	2.48
Snow and ice control[2]	54	639	11.74
Unspecified:[3]			
Reported	6,700	32,800	4.90
Estimated	2,300	13,200	5.73
Total or average	13,200	68,400	5.18

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes railroad ballast and filtration.

[3] Reported and estimated production without a breakdown by end use.

ARIZONA



Source: Arizona Department of Mines and Mineral Resources/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 2006, Arizona's nonfuel raw mineral production[1] was valued at $6.74 billion, based upon annual U.S. Geological Survey (USGS) data. This was nearly $2.4 billion, or 55%, higher than the State's total nonfuel mineral value in 2005, and more than double, $3.4 billion higher, the value of production in 2004. In 2006, for the second consecutive year, Arizona led the Nation in total nonfuel mineral production value among the 50 States, accounting for more than 10% of the U.S. total.

Arizona continued to be the Nation's leading copper-producing State in 2006 and accounted for nearly 64% of total U.S. copper mine production. Copper was the State's foremost nonfuel mineral produced, accounting for about 73% of the total nonfuel mineral production value, followed in descending order of value by molybdenum, construction sand and gravel (with nearly 10% of the State's total value), cement (portland and masonry), crushed stone (more than 1.5% of the value), and lime (table 1). Arizona's substantial increase in value in 2006 primarily resulted from the increased values of copper, construction sand and gravel, and crushed stone. With only a 3% increase in copper production, the commodity's production value rose about 87%, or slightly more than $2.3 billion, owing to a sharp rise in copper prices. The value of construction sand and gravel production increased by $146 million, a 28% increase from that of 2005, resulting from a nearly 11% rise in production and a significant increase in unit value. Higher unit values and a 9% increase in the production of crushed stone resulted in a $30 million, or 41% rise in its value of production (table 1). Smaller yet significant increases also took place (in descending order of change), in silver (up by about $9 million), crude gypsum, lime, and cement, the unit values of each also rising. The largest decrease in value took place in the production value of molybdenum; with a minimal increase in production, its value decreased by more than $100 million.

In 2006, Arizona continued to lead the Nation in the quantity of copper produced and remained first in the production of pumice and pumicite, third in that of crude perlite, fourth in zeolites, and sixth in dimension stone (dimension sandstone). The State rose in rank in the production of two nonfuel mineral commodities—to 6th from 7th in silver and to 9th from 15th in crude gypsum—and was tied for 10th in the production of lime. Arizona decreased in rank to third from first in the production of molybdenum concentrates, to third from second in construction sand and gravel, and to third from second in gemstones (gemstones based upon value). Additionally, the State continued to be a significant producer of, in descending order of value, portland cement, crushed stone, and masonry cement.

The Arizona Department of Mines and Mineral Resources[2] (ADMMR) provided the following narrative information. Data presented in ADMMR reports may differ somewhat from data reported by the USGS in table 1.

Commodity Review

Industrial Minerals

Gypsum.—National Gypsum announced plans to build a state-of-the-art $140 million wallboard plant at Eloy, midway between Phoenix and Tucson (National Gypsum Corp. 2006). The plant was expected to be operational by mid-2008 and will create 100 jobs. The plant's capability was expected to produce 93 million square meters per year of wallboard, enough to complete 100,000 average-sized homes. The site chosen is close to the gypsum quarries located in the San Pedro Valley, near the junction of Interstate Highways 8 and 10 and has rail access. The Eloy plant will serve regional markets from Los Angeles to Albuquerque by truck and distant markets such as Boise and Seattle by rail. Georgia Pacific has opened new gypsum quarries on Arizona Strip State land in northern Arizona. The new quarries were expected to become the largest producers of mineral revenue on State trust lands. The gypsum mined from these quarries will be used in wallboard production for the Las Vegas market.

Limestone.—In November, Drake Cement LLC received a decision for Cedar Glade, a proposed limestone quarry near Drake, in north central Arizona. After reviewing its environmental assessment, the U.S.D.A. Forest Service Prescott National Forest staff found no significant impact. Drake Cement LLC plans to extract up to 907,000 metric tons per year (t/yr) of limestone for a proposed cement plant.

Metals

Copper.—Copper contributed significantly to the dramatic rise in the value of the State's mineral production. Increased production at Mission Mine in Pima County and the other major mines was enough to offset a large decline in production at Bagdad Mine in Yavapai County. Arizona's copper production rose for the first time since 1997.

Phelps Dodge's mines accounted for nearly three-fourths of Arizona's copper production. The Morenci Mine in Greenlee County is the leading copper-producing complex in the United States. In 2006, the mine produced 370,000 metric tons (t) [816 million pounds (Mlbs)] of copper, more than one-half of the total copper production. After being an all leach operation since 2001, copper flotation concentration resumed in the second quarter. Phelps Dodge installed two pressure leach vessels at the world's first commercial scale concentrate-leach, direct electrowinning plant. The pressure leaching plant, which will use medium-temperature technology (160° C) was projected to begin operation in mid-2007 with a capacity of 68,000 t/yr (150 Mlbs). This process generates significantly less sulfuric acid than the high temperature process used at the Bagdad Mine, but requires less oxygen. Morenci's mining capacity was expected to reach 790,000 metric tons per day (t/day) by mid-2007 for the combined leach and mill operation.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Nyal J. Niemuth, Mining Engineer, authored the text of the State mineral industry information provided by the Arizona Department of Mines and Mineral Resources.

Phelps Dodge also operated the State's third and fourth largest copper mines, which also recovered large amounts of byproduct molybdenum. In 2006, the Bagdad Mine recovered 50,000 t (10.3 Mlbs) of molybdenum, while the Sierrita Mine in Pima County being Arizona's largest mill with capacity of 102,000 t recovered 9,000 t (20 Mlbs) of molybdenum. The Sierrita Mine operates two molybdenum roasters, a rhenium processing facility, and a copper sulfate plant. That plant produced 3,800 t (8.3 Mlbs) of copper sulfate containing 25% copper. In addition to its proven and probable reserves of 907 Mt grading 0.26% copper and 0.03% molybdenum, Sierrita also has 2.4 billion metric tons (Gt) of mineralized material grading 0.21% copper and 0.02% molybdenum.

In July, the Safford project in Graham County received its final required permit, an air quality permit from the Arizona Department of Environmental Quality. Shortly thereafter, construction began on the first major open pit copper mine since the San Manual open pit mine and leach operation opened in 1986. In 2006, Phelps Dodge invested $550 million to build the two new open pits, Dos Pobres and San Juan, and a heap-leach extraction-electrowinning (SX-EW) facility. Production is anticipated to begin in mid-2008 and reach an annual rate of 110,000 t/yr electrowinning copper. An 18-year life was expected for the deposits' combined 488 Mt that contain an average of 0.37% copper. The planned crushing facility will have a design rate of 103,000 t/day of ore, while mining capacity will probably be 285,000 t/day. The development is expected to have a major positive impact on the local economy by generating approximately 500 construction and 500 permanent jobs. A major drilling program was conducted at the Lone Star deposit area about 6 kilometers (km) from the Dos Pobres Pit.

Asarco LLC benefited not only from higher prices, but continued operation under the protection of the U.S. Federal Bankruptcy Court. Asarco LLC's three mines produced 170,000 t of copper including Mitsui & Company's share of Silver Bell Mining, LLC in Pima County. Asarco LLC had a net income of $571 million and had cash assets of $497 million at yearend. The company received court approval to spend some of those assets on operating equipment. A new labor contract was negotiated that provided not only improved wages and benefits for the workers, but also required any buyer to honor the union contract in the event the company is sold.

In June, Asarco LLC ordered nine 363-metric-ton Liebherr T282B trucks for the Ray Mine in Pinal County that were scheduled for early 2007 delivery. These would be the largest capacity haul trucks in Arizona. The Ray Mine typically moves ore at a rate of 227,000 t/day. The Mission Mine in Pima County could benefit by getting surplus trucks from the Ray Mine in order to further increase its production. Asarco LLC Inc. purchased the Copper Basin Railway for $11.5 million. The railway connects the Ray Mine to the Hayden Mill and smelter complex and has 60 km of rail connecting to the mainline. Production at the Mission Mine increased by140%, reaching the highest level since 2001. Production of molybdenum resumed in December following a $775,000 expenditure for refurbishing the facility and hiring 17 new employees. The Mission Mine is expected to recover 204 t/yr (450,000 lbs) of molybdenum.

Resolution Copper Mining continued drilling on the deep, high-grade Resolution Copper deposit in Pinal County. By yearend, only about 50 drill holes had been completed owing to limited access and the required directional drilling that slows exploration. An aggressive drill campaign was planned for the next 3 years to prepare for a prefeasibility study. At the Mineral Park Mine, in Mohave County, Mercator Minerals Ltd.'s improvements to the SX-EW plant led to production of 4,300 t (9.5 Mlbs) of copper or a 48% increase from that of 2005. In December, Mercator published an updated preliminary feasibility study for a proposed milling operation at Mineral Park to produce copper and molybdenum concentrates. Mercator had planned to install a 33,600 t/day milling operation using Asarco's inactive Mission South Mill. Asarco LLC challenged that purchase in the Federal U.S. Bankruptcy Court, even though the purchase was made prior to Asarco's declaration of bankruptcy.

Mercator Minerals Ltd. decided to proceed with an even larger expansion. In December, it placed orders for two new 7,500-horsepower ball mills and three used 10-meter semiautogenous grinding mills with a projected capacity of 45,000 t/day. When the expansion is completed, annual mill recovery of more than 26,000 t (57 Mlbs) of copper and 5,700 t (13 Mlbs) of molybdenum is expected. A preliminary feasibility study reported proven and probable mill reserves of 396 Mt having a copper equivalent grade of 0.38%. In November, Quadra Mining Ltd.'s board approved raising money to construct the Carlota open pit, leach, SX-EW project. Initial capital costs were estimated to be $128 million. The solvent extraction plant (formerly used at the San Manuel Mine) acquired as part of the purchase from Cambior Inc. in 2005 was onsite, while the mining equipment were expected to arrive and be assembled. The estimated resources are 80 Mt grading 0.45% copper, enough for a 9-year mine life at a production rate of 30,000 t/yr (66 Mlbs).

Bell Resources Co. and Redhawk Resources, Inc. explored the Copper Creek District southeast of Phoenix. Redhawk Resources Inc. in Pinal County has acquired a large portion of this district consisting of high-level breccia pipes and lower level porphyry copper targets. The company conducted a relogging and sampling program of 24,000 meters (m) of core to complete a resource estimate for the Mammoth, Childs-Aldwinkle, Old Reliable, and Keel Zones. Redhawk Resources Inc. announced a 3,000-m core drilling program to begin at the Mammoth deposit. Goals were to expand the deposit, test the deeper Keel Zone, and drill across the breccia structure to test contact zones. Bell Resources Corporation began a 10-hole, 1,400-m diamond drill program on the Sombrero Butte property including portions acquired from Silver Nickel Mining. Results included grades of 4.7% copper over more than a 20-m interval. These and other results encouraged the company to extend the drilling program into 2007. Bell Resources Corp. also conducted airborne and IP geophysics along with geochemistry studies to identify drill targets at its Kabba porphyry copper target in Mohave County. Based on these investigations from a database of 447 holes representing 34,500 m of previous drilling, there may be a resource of 57 Mt of 0.37% copper. The company decided to focus its efforts on the larger leach potential here rather than at the smaller Emerald Isle project.

General Minerals Corp. optioned the Monitor property, located near the Ray Mine, to Teck Cominco Ltd. that completed a six-hole, 1,160-m diamond drill program to test previously identified copper and silver targets. Teck Cominco Ltd. dropped its interest after releasing mixed drilling results. Big Bar Gold optioned the nearby Troy prospect from Silver Nickel Mining. Big Bar Gold Corp. completed a 19-hole diamond drill program at Yuma King that extended known mineralization in the small, but high-grade (3.0%), copper deposit. Aurelio Resources Corp. signed a purchase agreement to acquire Hope Mining Company Inc. and Milling's patented mining claims at Courtland Gleason and announced approximately 45 Mt of near-surface copper oxide resources. The company began a 2,300-m core-drilling program designed to confirm and expand prior work from 170 historic drill holes from the MAN and Courtland properties.

Lone Tree Exploration LLC acquired the Sheep Mountain property and assembled historic exploration and drill data. Effects of structural complexities and Miocene volcanism indicate areas of continued exploration. Lebon Gold Mines Limited optioned a second area of mineralization to the west from MinQuest Inc. A drill program of 3 to 8 holes was scheduled to begin in early 2007. In addition to Phelps Dodge, a number of other companies were active in the Safford District. Franconia Minerals Corp. started a core-drilling program at the Red Knoll property in Graham County as a followup on a 4-line, 17-km geophysical survey. Four drill holes totaling 3,000 m are planned. General Minerals Corp. optioned the Markham Wash property to Teck Cominco Ltd. Nord Resources Corp. will be doing initial planning work followed by drilling in 2007 on the Coyote Springs property. Southwest Exploration Services LLC completed work identifying three targets for additional exploration. They include the untested Mine Wash in the northwestern portion of the district, Safford West covering an IP anomaly buried by younger alluvium, and the Teague Springs prospect.

Gold and Silver.—American Bonanza Gold Corp. completed a 40,000-meter diamond drill program at the detachment-hosted Copperstone deposit in La Paz County in February 2006 and announced resources of 10,000 kilograms (kg) (330,000 troy ounces) of gold. There are plans to test 10 geophysical and structural step-out target zones that have the potential of adding significant mineralization. The initial drill phase planned an estimated 23,000 m in 50 holes. Six of the targets tested returned results that warrant followup drilling. On a parallel path with the exploration program, the company collected environmental, geotechnical, hydrological, and metallurgical baseline data to support mine permitting and project design.

Comcorp Ventures Inc. spent $10 million to acquire 80% of Arizona Minerals Inc., a private Nevada company, to gain control of the Hardshell Mine in Santa Cruz County. A previous resource assessment by Asarco Inc. identified 2,100 t (67 million troy ounces) of silver. The company, now called Wildcat Silver Corp., plans drilling to confirm this estimate.

Environmental Issues, Reclamation and Related Technological Activities

Augusta Resources continued with an aggressive schedule for exploration of the Rosemont project in Pima County. Although the project contains four deposits, work has focused on advancing the Rosemont porphyry skarn occurrence with 493 Mt and a 0.75% Cu equivalent grade. A 20,000-m diamond drill program was conducted by Augusta Resources to better define areas of oxide mineralization, provide information on gold and silver grades, and obtain geotechnical information to support open pit slope design. The company acquired the rights to use Central Arizona Project water for the project and plans to begin storing water underground in 2007. Dry tailings disposal was planned to conserve water, and high carbonate waste rock was to be used to eliminate dust and future acid mine drainage concerns. A preliminary plan of operations was submitted to the U.S. Forest Service Coronado National Forest for leach, mill, and waste facilities.

BHP Billiton worked toward reopening the Pinto Valley Mine, Gila County, in 2007 with plans to mine slice number 6. This portion of the mine is expected to provide 5 years of feed for the mill. BHP Billiton and Carlota Copper Co. (a subsidiary of Quadra Mining Ltd.) began cleanup of the Gibson Mine acid mine drainage located above the property. As part of the $2.5 million cleanup of Pinto Creek, about 109,000 t of sulfide material was moved from the Gibson Mine to Pinto Valley. The Franciscan Friars of California own the Gibson Mine, but BHP and Quadra provided funds for the project. Underground work was initiated to refurbish and extend the Neversweat Tunnel in preparation for the deepening of the number 9 shaft and sinking of the number 10 shaft.

The Arizona Legislature passed a bill that would create the Tam O'Shanter Park, a climbing area to compensate for the loss of climbing areas at Oak Flats. El Paso Natural Gas Co. (a subsidiary of El Paso Corp.) announced plans to construct an underground natural gas storage facility near Eloy (El Paso Natural Gas Company, 2006). The plans called for four underground salt caverns capable of storing 99 million cubic meters of natural gas. The facility will be designed to deliver 9.9 million cubic meters per day of natural gas, enough to meet the energy needs of 735,000 homes. El Paso Natural Gas Co. planned to file an application with the Federal Energy Regulatory Commission for permission to proceed. The first cavern could be in service by mid-2010 and the remaining three caverns by 2011–12. Engelhard Corporation broke ground on a multimillion dollar facility to produce hydro frac sand proppants in Sanders near its Cheto deposit. Proppants are used to enhance production rates of oil and gas fields. The plant is expected to reach full production in 2007 (Engelhard Corporation, 2006).

Mineral Fuels and Related Materials

Uranium.—Uranium exploration in Arizona continued at a high level. Mining activity was concentrated in three areas, the collapse breccia pipes on the Colorado Plateau, central Arizona, and the Date Creek Basin in west central Arizona. Numerous companies were active acquiring prospective ground hosting high-grade (up to 1%) uranium mineralization in solution collapse breccia pipes. International Uranium Corp. (IUC) merged with Denison Mines Inc. in December. Denison Mines Inc. became a subsidiary of IUC. The new entity known as Denison Mines Corp. IUC anticipated that the developed Arizona One property containing ore grading 0.65% uranium would be in production in the summer 2007. The ore was to be trucked to its White Mesa mill located in southeastern Utah. Denison Mines Inc. IUC controlled the developed Pine Nut and partially developed Canyon Pipe properties that produce ore grading 0.95% uranium. Tournigan Gold Corporation announced results from soil geochemical surveys of more than 65 suspected pipes; positive anomalies were found in more than17 pipes on the north rim (Tournigan Energy Ltd., 2006). Further geophysical investigations are planned. The company acquired additional ground and now controls 84 potential pipe targets.

Liberty Star Uranium and Metals Corp. continued exploration on its extensive holdings with drilling on three of its most appealing targets. Vane Resources has four confirmed breccia pipes and received approval for drilling at its Miller and Red Dike properties on the Coconino Plateau in Coconico County. Quaterra Resources Inc. began a geophysical survey coupled with helicopter-assisted blanket staking of more than 5,000 new claims. The claims have been selectively chosen to cover most of the high priority anomalies in the center of the uranium district. Quaterra Resources Inc. is the first company to extensively test its airborne time domain electromagnetic system in the district. The survey was designed to identify new targets with geophysical signatures that are similar to previously recognized breccia pipes. U.S. Energy has 27 targets to be evaluated. Drilling in early 2006 confirmed two breccia pipes. Quincy Energy Corp. (acquired by Energy Metals Corp.) completed exploratory drilling on the Rose pipe property and is evaluating core samples and logging results.

In central Arizona, several corporations were active in uranium exploration. Golden Patriot Corp. exercised its option to acquire a 60% interest in the Lucky Boy Mine in Gila County after drilling on the property. The company analyzed more than 1.8 t (4,000 lbs) of samples with results showing uranium grades ranging from 0.12% to 0.13%. In the 1950s, the Lucky Boy Mine was one of the first uranium properties to go into production in central Arizona and produced more than 1,800 t of 0.16% ore. The Lucky Boy Mine was one of the last mines to produce in the late 1970s, 4.5 t of U_3O_8 from heap-leach operations. Rodinia Minerals Inc. obtained the rights to explore 40% of the Lucky Boy Mine from Golden Patriot Corp. and also has a joint venture with Patriot on the Mormon Lake Property in Gila County. The company conducted drilling in the Pennsylvanian sediments below Promontory Butte and acquired properties in the Sierra Ancha Mountains. Previous production in this area was from the Workman Creek and Red Bluff Mines totaling more than 52 t (115,000 lbs) of U_3O_8. Uranium Core Company agreed to acquire a 75% interest in Rodinia's Suckerite, Pendleton Mesa, Coon Creek, and Oak Creek properties in the same district. In August 2006, Yukon Resources acquired 69 claims contiguous to Rodinia's Workman Creek project and will evaluate and conduct fieldwork.

Exploration in west central Arizona's Date Creek Basin focused on past-producing mines and previously drilled properties. These properties are situated within Miocene lacustrine/paludal sedimentary rocks contained within a disrupted caldera. The uranium mineralization occurs as stratabound units in carbonaceous siltstones and mudstones. Concentric Energy Corp. evaluated extensive historic data from the past-producing Anderson Mine in Yavapai County. The company drilled 23 holes to confirm resources defined during the 1970s. The work completed in late 2006 verified 43% of the historic resource estimates. Universal Uranium Ltd. acquired properties to the west in the Artillery Peak range. The uranium mineralization and stratigraphy is similar to that at the Anderson Uranium Mine (Brooks, 1984).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, bentonite	W	W	33	1,670	34	1,710
Copper[3]	723	2,130,000	690	2,640,000	712	4,950,000
Gemstones, natural	NA	1,450	NA	1,370	NA	1,560
Sand and gravel:						
Construction	79,600	430,000	84,900	516,000	94,000	662,000
Industrial	W	792	W	W	W	W
Stone, crushed	14,100	75,900	12,100 [r, 4]	72,400 [r, 4]	13,200	102,000
Combined values of cement, clays (common), gold gypsum (crude), lime, molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone [crushed traprock (2005), dimension sandstone], zeolites, and values indicated by the symbol W	XX	709,000	XX	1,120,000	XX	1,020,000
Total	XX	3,350,000	XX	4,350,000	XX	6,740,000

[r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data.
XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Recoverable content of ores, etc.

[4] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	7	6,340	$34,100 [r]	7	6,230	$46,400
Marble	1 [r]	233 [r]	1,440 [r]	1	174	1,360
Granite	17	3,440 [r]	22,700 [r]	24	3,800	35,000
Traprock	2	W	W	4	436	3,420
Sandstone and quartzite	4 [r]	582 [r]	6,790	4	421	3,190
Volcanic cinder and scoria	5	151	827 [r]	7	86	676
Miscellaneous stone	5 [r]	1,300 [r]	6,520 [r]	16	2,010	12,400
Total	XX	12,100 [r]	72,400 [r]	XX	13,200	102,000

[r]Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	23	288
Filter stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	(2)	(2)
Railroad ballast	(2)	(2)
Total	1,010	8,880
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Coarse and fine aggregates:		
Graded road base or subbase	(2)	(2)
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	(2)	(2)
Other coarse and fine aggregates	553	5,580
Total	1,080	12,400
Other construction materials	10	106
Chemical and metallurgical, cement manufacture	W	W
Unspecified:[3]		
Reported	1,930	11,600
Estimated	5,000	37,000
Total	6,920	48,200
Grand total	13,200	102,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--	--	--
Coarse aggregate, graded[3]	W	W	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--	--	--
Coarse and fine aggregates[5]	W	W	W	W	W	W	--	--
Other construction materials	10	106	--	--	--	--	--	--
Chemical and metallurgical[6]	W	W	--	--	W	W	--	--
Unspecified:[7]								
Reported	65	509	176	1,380	7	57	1,680	9,690
Estimated	2,200	14,000	90	720	2,700	22,000	--	--
Total	5,010	37,100	614	4,710	5,860	50,900	1,680	9,690

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes riprap and jetty stone and filter stone.

[3] Includes concrete aggregate (coarse), bituminous aggregate (coarse), and railroad ballast.

[4] Includes stone sand (concrete) and stone sand (bituminous mix or seal).

[5] Includes graded road base or subbase, terrazzo and exposed aggregate, crusher run or fill or waste, and other coarse and fine aggregates.

[6] Includes cement manufacture.

[7] Reported and estimated production without a breakdown by end use.

TABLE 5
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	15,800	$119,000	$7.52
Plaster and gunite sands	582	6,550	11.26
Asphaltic concrete aggregates and other bituminous mixtures	4,690	41,000	8.75
Road base and coverings	9,070	56,100	6.18
Fill	1,580	7,790	4.92
Other miscellaneous uses[2]	48	349	7.22
Unspecified:[3]			
Reported	32,700	228,000	6.97
Estimated	28,500	196,000	6.87
Total or average	94,000	662,000	7.05

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes snow and ice control, railroad ballast, and filtration.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified district	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	990	12,600	663	5,080	14,800	108,000	5	36
Asphaltic concrete aggregates and road base materials	1,460	9,630	773	6,770	9,640	65,100	1,900	15,700
Fill	236	1,310	510	1,910	837	4,570	--	--
Other miscellaneous uses[3]	395	3,080	10	113	624	4,780	818	1,580
Unspecified:[4]								
Reported	4,920	35,100	1,080	5,980	25,900	185,000	--	--
Estimated	3,380	23,300	1,170	8,060	23,900	164,000	--	--
Total	11,400	85,000	4,200	27,900	75,700	532,000	2,720	17,300

-- Zero.

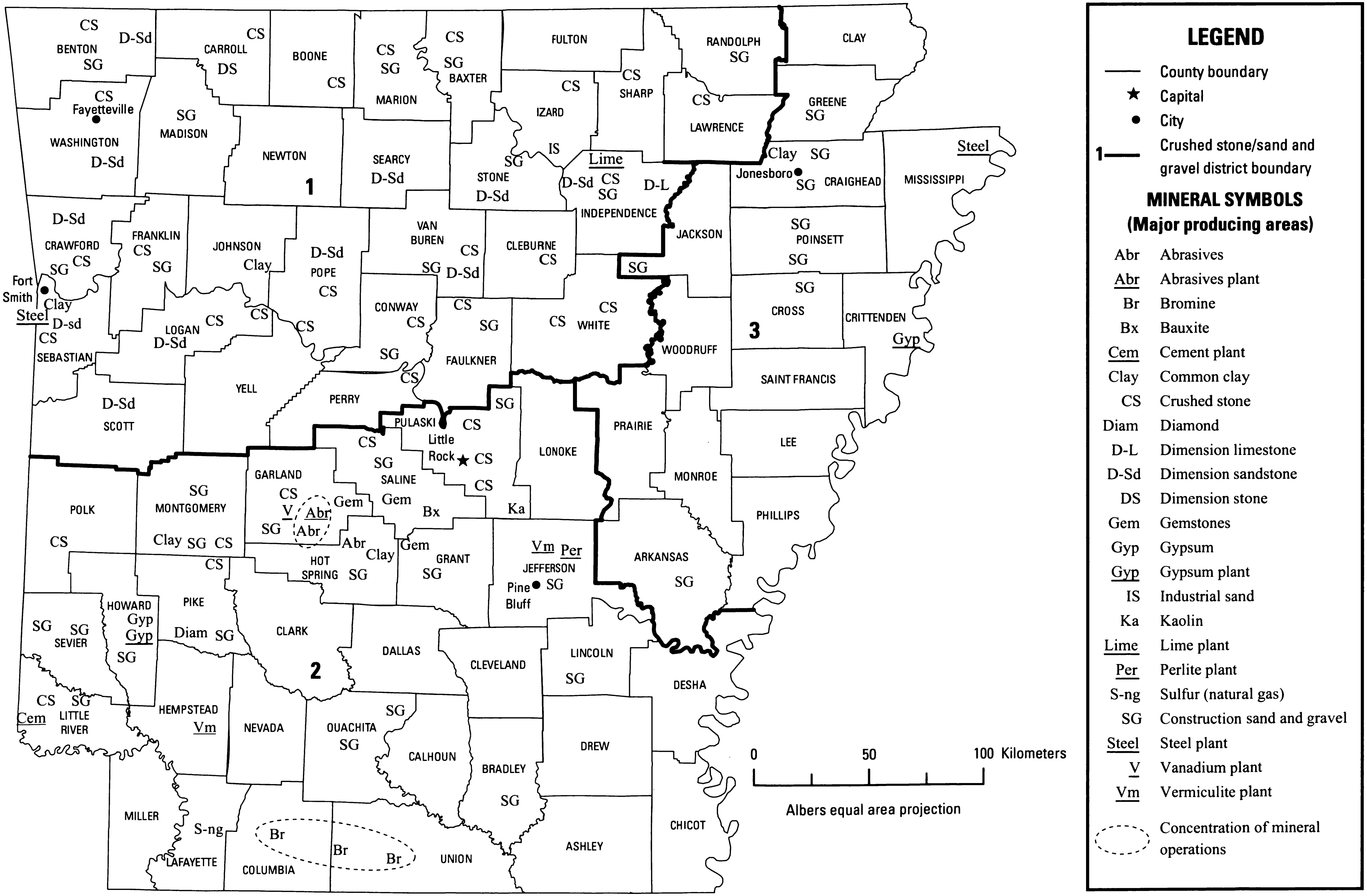
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes snow and ice control, railroad ballast, and filtration.

[4] Reported and estimated production without a breakdown by end use.

ARKANSAS



Source: Arkansas Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Survey for collecting information on all nonfuel minerals.

In 2006 Arkansas' nonfuel raw mineral production[1] was valued at $789 million, based upon annual U.S. Geological Survey (USGS) data. This was a 32% increase from the State's total value of $597 million in 2005, which followed a $66 million, or more than 12%, increase from 2004 to 2005. The State rose to 28th from 32d in rank among the 50 States in total nonfuel mineral production value in 2006 and accounted for more than 1% of the U.S. total. Yet, per capita, the State ranked 15th in the Nation in 2006 in its minerals industry's value of nonfuel mineral production; with a population of slightly more than 2.8 million, the value of production was about $281 per capita.

In 2006, bromine followed by crushed stone, cement (portland and masonry combined), and construction sand and gravel were Arkansas' leading nonfuel minerals by value, these commodities together accounting for 92% of the State's total nonfuel mineral value. For nearly four decades, bromine and crushed stone, by value, have been the State's two leading nonfuel minerals, bromine leading in value from 1969 up to 1996 when crushed stone went from second to first. Since then the two have exchanged rank several times; crushed stone was first in 1996–98, 2001–03, and 2005, and bromine was first in 2006 and the intervening years. For more than a decade, cement has ranked third and construction sand and gravel has ranked fourth. Actual production data for bromine and cement have been withheld (company proprietary data).

In 2006, the largest increase in value took place in bromine. A relatively modest increase in bromine production resulted in a more than $150 million rise in its value owing to a substantial rise in the mineral commodity's unit value. Increases also took place in the values of crushed stone, up by $7 million, construction sand and gravel increased $11.6, followed by lesser although significant increases (in descending order of change) in the values of cement, lime, and industrial sand and gravel. On a yet smaller scale, decreases took place in crude gypsum, kaolin, special silica stone, and Tripoli. The value of gemstones also was down, by about 38% (table 1).

Arkansas continued to be the leading bromine-producing State and accounted for most of the U.S. production in 2006. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas continued to be the only State that produced silica stone and the State remained third in the quantities of tripoli of four producing States and fifth in gemstones (gemstones based upon value). Additionally, significant quantities of construction sand and gravel, crushed stone, industrial sand and gravel, and lime were produced in the State. Metals that were produced in the State—for the most part raw steel—were processed from materials acquired from other domestic and foreign sources. The principal steel mills in the State were Quanex Corp. in Sebastion County, Nucor-Yamato Steel Co. and Nucor Corp. in Mississippi County, and Arkansas Steel Associates in Jackson County. These mills had a combined capacity of nearly 5.9 million metric tons per day. Strategic Minerals Corp., or Stratcor, continued operation of the mill facility at Potash Sulphur Springs in Garland County; the mill extracts vanadium pentoxide from recycled out-of-State vanadium-bearing feed.

The Arkansas Geological Survey[2] (AGS) [formerly the Arkansas Geological Commission (AGC)] provided the following narrative information.

Exploration and Development

Numerous companies were engaged in exploration, mine expansion, and facility construction activities to further the development of the minerals industry within the State. Arkhola Sand and Gravel Co. and Duffield Stone and Gravel Co. continued to explore for additional quarry sites in the Arkansas River Valley. McClinton-Anchor, Inc. explored further for new aggregate quarry sites in the limestone-bearing region of northwest Arkansas. Rogers Group, Inc. also evaluated new quarry sites in northwest Arkansas in the Boone and Pitkin geologic formations characteristic of the Mississippian period. Vulcan Materials Co. continued exploring for aggregates, with the focus on Morrowan and Atokan age sandstones in Cleburne and White Counties. Martin Marietta Co. acquired new leases east of its Hatton quarry that extended to near the Cossattot River. The company also planned to install a third crusher and processing unit at the Hatton site. Unimin Corporation and Arkhola opened a new market for its industrial sand, using the sand as a proppant in the development of the Fayetteville Shale natural gas deposit within the Arkansas Valley region of the State.

Commodity Review

Industrial Minerals

Bromine.—In 2006, Chemtura Corporation reached an agreement with TETRA Technologies, Inc. to invest in the construction of a processing facility on property adjacent to

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] J. Michael Howard, Geology Supervisor/Mineralogist, authored the text of the State mineral industry information provided by the Arkansas Geological Survey.

Chemtura's El Dorado bromine facility. TETRA planned to produce calcium chloride and other salts using, as the feedstock, the bromine tail brines purchased from Chemtura. TETRA, in turn, planned to sell sodium chloride and magnesium hydroxide extracted from the tail brine to Chemtura for use as a feedstock in the production of chlorine. Albermarle Corporation and Chemtura continued operations at their bromine extraction and production plants in Columbia and Union Counties, respectively. Prices for bromine-based products steadily increased worldwide during the year.

Gypsum.—The Bpb Gypsum mine and wallboard manufacturing plant near Nashville, Howard County, were acquired in early January by Saint-Gobain, a France-based manufacturer and distributor of building materials. The Bpb operation continued to be the world's leading wallboard producer, with the capacity to produce 130 million square meters per year of wallboard. The principal market for the wallboard, sold under the trade name CertainTeed, was in the eastern United States.

Nepheline Syenite.—Minnesota Mining and Manufacturing Company (3M company), Maplewood, MN, mined nepheline syenite from its Big Rock Arch Street Quarry to supply material for its roofing granule plant in Sweet Home, Pulaski County. Granite Mountain Quarries, Inc. produced aggregate from nepheline syenite mined at Granite Mountain quarry near Bryant, Saline County, and at two quarries in Pulaski County.

Sand and Gravel, Construction.—At yearend, there were 109 permitted sites that produced sand and gravel. There were 34 quarries operating under authorizations issued by the Arkansas Department of Environmental Quality (ADEQ) Mining Division.

Sand and Gravel, Industrial.—Industrial sand was produced by Unimin at its mine and processing facility in Guion, Izard County. The sand was sourced from the Ordovician St. Peter Sandstone formation, found prevalent throughout midwestern United States. Markets for this sand include primarily the glass and foundry industries. Arkhola also produced industrial sand from its dredging operations on the Arkansas River, along with some sand that could be used for construction purposes.

Stone, Crushed.—Arkhola produced road aggregates and asphalt mix at the Preston Quarry near Van Buren, Crawford County and continued to mine the Hartshorne Sandstone quarry near the Jenny Lind Mine, Sebastian County. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, leased its quarry and property south of Kirby in central Pike County to Pike County Construction Company.

Duffield Stone and Gravel Co. operated two sandstone aggregate quarries (Pennsylvanian Period) in Pope County; one in the Hartshorne Sandstone at Russellville, and the other, the Gumlog Quarry, in the upper Atoka formation. Pyramid Co. produced aggregate from the middle Atoka formation (Pennsylvanian Period) north of Greenbriar, Faulkner County.

Martin Marietta actively quarried the Hatton Tuff lentil of the Stanley Group (Mississippian Period) at the Hatton Quarry in southern Polk County. The company also continued operations at the Jones Mill Quarry near Magnet Cove, Hot Spring County, and produced aggregate from both the hornfels and quartzite alteration zone in the Stanley Group adjacent to the Cretaceous igneous intrusion and the intrusive rock. It also operated an asphalt plant at this site.

Rogers Group, Inc. continued sandstone aggregate operations at its Greenbriar Quarry in the middle Atoka formation in Faulkner County. The company also carried out mining at its Conway County Quarry in upper Atoka formation south of Solgohachia, and at its Lowell Quarry limestone deposit of the Boone formation (Mississippian Period) in southern Benton County. Texas Industries Group continued to evaluate tuff deposits on leases in southern Polk County. McGeorge Sand and Gravel Co. continued riprap construction along the Arkansas River, transporting rock by barge from its River Mountain Quarry in the Hartshorne Sandstone area north of New Blaine in eastern Logan County. Chrisman Co. mined sandstone aggregate in the Hartshorne Sandstone area near Hunt in Johnson County and from the Savanna Formation near Ratcliffe, Franklin County.

Vulcan produced aggregate from its upper Morrowan age sandstone operations at Judsonia and middle Atokan age sandstones at Floyd in White County. Vulcan also produced dolomitic limestone from lower Ordovician units near Black Rock, Lawrence County. Webco Mining, Inc. produced crushed stone from its quarry in the middle Atoka formation near El Paso, White County. Quality Stone Co. produced sandstone aggregate from the Atoka formation (Pennsylvanian Period) at its Lonestar quarry in south Cleburne County, north of the Rosebud community. Midwest Lime Company produced aggregate from middle and upper Ordovician-Period limestone near Batesville, Independence County. Limestone Specialties, Inc. produced aggregate from upper Ordovician units in Independence County.

Stone, Dimension.—Oran McBride Stone Co., Batesville, Independence County continued production of interior and exterior structural and architectural stone at its plant in Bethesda. Polished, cut, and rough surface marble, limestone, and sandstone were produced by the company from Ordovician and Mississippian-Period formations. Broken dimension stone (Cotter formation) of various tones was produced by Johnson Landscaping from its quarry north of Eureka Springs in Carroll County. The Eureka Stone Co. stone-shaping operation near the quarry produced a variety of architectural pieces. Bennett Brothers Stone Co., Inc. obtained building stone materials from deposits in Franklin, Garland, Logan, and other counties, principally from Pennsylvanian-Period formations. Schwartz Stone Co. quarried sandstone from the Hartshorne Sandstone quarry north of Midway, Logan County, for use as dimension stone as well as aggregate.

Other Industrial Minerals.—Ash Grove Cement Co., the sole producer of cement in the State, operated the Foreman plant in Little River County. Ash Grove used limestone obtained from the Annona formation and silica obtained from the Marlbrook formation (Cretaceous Period) as cement ingredients. Acme Brick Co., Malvern, Hot Spring County, operated its Wilcox Group clay mines at Perla, AR, to acquire the raw material for its brick production operations. United States Lime & Minerals, Inc. of Batesville, Independence County, produced hydrated lime, pulverized limestone, and quick lime for agricultural use and glass manufacturing. Its quarry is located in a region of high-purity, Ordovician-Period limestone containing a low concentration of silica (chert).

Seven companies mined and processed whetstones in the Hot Springs, Garland County, area during the year. These included B & C Abrasives, Blue Mountain Whetstone, Dan's Whetstone Co., Eagle Mountain Whetstones, Halls Arkansas Oilstones, Inc., Saint Gobain (Norton), and Smiths Abrasives, Inc. Interest in the Mississippian-Devonian Arkansas Novaculite as oilstones continued to increase, as a result of it being viewed as a more preferable grinding and sharpening abrasive than synthetic alternatives. Martin Marietta produced aggregate and high-silica novaculite from a quarry near Glen Rose, Hot Spring County. Malvern Minerals Co. recovered tripoli from its mine in the Bigfork chert region east of Hot Springs in Garland County. The raw material was then processed for commercial use, as a polishing powder or for other purposes, at the company's plant in Hot Springs.

Environmental Issues and Mine Reclamation

Near the end of 2006, three proposed in-stream mine permits were denied. The denials were based on the designation of the creeks to be mined as impaired water bodies under the U.S. Environmental Protection Agency's Clean Water Act, section 303(d), listing for the State. Two of the permit applications subsequently were appealed to the Arkansas Pollution Control and Ecology Commission for further consideration. An administrative hearing on the appeals was to be held in 2007.

There were 97 hectares (ha) of reclaimed land released from 14 permitted sites during 2006. Umetco, Inc. continued reclamation of the LeCroy area at the Wilson Springs vanadium mines in Garland County that began in 1997.

Government Legislation, Programs, and Activities

During 2006, 236 noncoal mine sites were permitted, or authorized in Arkansas. The total noncoal area under permit was nearly 6,180 ha with 4,700 ha under surety bond.

The ADEQ received the authority to develop and issue general permits under its Non-Coal Program as a result of the passage of Act 855 by the State legislature in 2005. The Arkansas Open Cut Mining and Land Reclamation Code (Regulation 15) subsequently was modified in May 2006 to incorporate this new legislation. Regulation 15 provides the noncoal mining operations with a set of performance standards that must be followed during mining and during the process of reclaiming the land to beneficial use.

Operators of 21 quartz contracts and three leases with the U.S. Department of Agriculture's Forest Service on the Ouachita National Forest generated about $10,000 in revenue. Approximately $20,000 in revenue was generated from 32 sand and gravel and stone operations.

In 2006, 488 diamonds were recovered at the Crater of Diamonds State Park, Pike County, the world's only diamond-bearing site that is open to the general public. The total weight of the stones was 117.51 carats, with an average weight of 0.24 carat. Of these 488 diamonds, 15 weighed more than 1 carat. Diamonds recovered included 295 white, 106 brown, and 87 yellow. In 2006, the largest stone recovered was a brown diamond that weighed 6.35 carats. More than 27,000 diamonds have been recovered since this property became a State Park in 1972. A new facility at the Park, the Diamond Discovery Center, had its first full year of operation in 2006. Additional plans for the Park include a new museum.

The AGS (AGC) Web site at URL http://www.state.ar.us/agc/agc.htm hosted more than 169,000 visitors in 2006, which was its 8th year of online operation. The number of visitors to the site represented a 25.8% increase, compared with that of 2005. Information posted on the Web site included agency services; news items; online geologic maps; publications and map-ordering information; State resource data; State stratigraphic, geologic, and geohazard data; and USGS annual nonfuel mineral production data. The site has links to State agency services, Federal agencies, geology Web sites, organizations, and universities.

The AGS (AGC) staff continued preparation of a spreadsheet database that contains all identified sites of mineral extraction in the State, excluding petroleum and natural gas. By the close of 2006, more than 7,400 entries had been made. Sites are located by latitude and longitude and by general land office survey techniques. Fieldwork began in October 2005 to check data on a county-by-county basis. Approximately 40% of those entries remained to be field checked at yearend.

The AGS (AGC) has been an active participant in the STATEMAP program since 1995. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. During 2006, three digitized 7.5-minute USGS topographic geologic maps and one 1:100,000 digital compilation map were completed under the STATEMAP cooperative agreement. Three additional 7.5-minute geologic maps were started in July, as well as another 1:100,000 compilation map. Additional information about the STATEMAP geologic mapping program in Arkansas can be found on the AGS (AGC) Web site.

Staff cartographers completed the digitization of 16 additional USGS 7.5-minute topographic-based geologic maps across Arkansas, with legends. Digitized 7.5-minute geologic maps are available for download as free .pdf files on the AGS (AGC) Web site.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, common		1,150	1,510	1,210	1,900	1,140	2,550
Gemstones, natural		NA	590	NA	711	NA	439
Sand and gravel, construction		9,370	53,500	10,600	62,000	11,100	73,600
Silica stone[3]	metric tons	655	3,660	576	2,290	227	992
Stone, crushed		34,100 [4]	173,000 [4]	37,200 [r, 4]	229,000 [r, 4]	34,800 [4]	236,000 [4]
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (crushed slate, dimension limestone, and sandstone), tripoli		XX	299,000	XX	302,000	XX	475,000
Total		XX	531,000	XX	597,000 [r]	XX	789,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[4] Excludes certain types of crushed stones; kind and value included with "Combined values" data.

TABLE 2
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	28 [r]	13,800 [r]	$84,600 [r]	30	12,800	$87,700
Dolomite	1	1,370	9,830	1	572	4,100
Granite	4	10,000 [r]	57,400 [r]	5	7,290	47,100
Sandstone and quartzite	19 [r]	10,800 [r]	69,500 [r]	21	12,900	90,300
Slate	1	W	W	1	W	W
Miscellaneous stone	5 [r]	1,110 [r]	7,330 [r]	9	1,150	6,930
Total	XX	37,200 [r]	229,000 [r]	XX	34,800	236,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	48	390
Filter stone	139	819
Other coarse aggregate	195	1,300
Total	382	2,510
Coarse aggregate, graded:		
Concrete aggregate, coarse	884	7,040
Bituminous aggregate, coarse	225	1,930
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	4	20
Other graded coarse aggregate	523	4,340
Total	1,640	13,300
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(3)	(3)
Screening, undesignated	378	1,210
Other fine aggregate	206	2,070
Total	584	3,290
Coarse and fine aggregates:		
Graded road base or subbase	2,220	14,200
Unpaved road surfacing	60	285
Crusher run or fill or waste	(4)	(4)
Roofing granules	(4)	(4)
Other coarse and fine aggregates	2,520	14,400
Total	5,040	29,900
Other construction materials	53	298
Agricultural:		
Limestone	(5)	(5)
Poultry grit and mineral food	(5)	(5)
Other agricultural uses	(5)	(5)
Chemical and metallurgical:		
Lime manufacture	(5)	(5)
Glass manufacture	(5)	(5)
Special:		
Asphalt fillers or extenders	(5)	(5)
Other fillers or extenders	(5)	(5)
Other miscellaneous uses:		
Abrasives	(5)	(5)
Other specified uses not listed	(5)	(5)
Unspecified:[6]		
Reported	16,000	107,000
Estimated	10,000	73,000
Total	26,300	180,000
Grand total	34,800	236,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[3] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[4] Withheld to avoid disclosing company proprietary data; included in "Total."

[5] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6] Reported and estimated production without a breakdown by end use.

TABLE 4
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	317	2,130	W	W	W	W
Coarse aggregate, graded[3]	W	W	--	--	W	W
Fine aggregate (-⅜ inch)[4]	536	3,170	W	W	W	W
Coarse and fine aggregates[5]	4,280	25,700	W	W	W	W
Other construction materials	53	298	--	--	--	--
Agricultural[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	W	W	--	--	--	--
Special[8]	W	W	W	W	--	--
Other miscellaneous uses[9]	--	--	W	W	--	--
Unspecified:[10]						
Reported	8,470	58,200	7,560	49,100	--	--
Estimated	5,100	36,000	5,100	37,000	--	--
Total	21,400	146,000	13,400	89,200	40	537

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7] Includes lime and glass manufacture.

[8] Includes asphalt fillers or extenders and other fillers or extenders.

[9] Includes abrasives and other specified uses not listed.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	2,470	$17,600	$7.12
Asphaltic concrete aggregates and other bituminous mixtures	488	4,170	8.56
Road base and coverings	450	2,010	4.46
Fill	164	988	6.02
Other miscellaneous uses[3]	26	574	5.42
Unspecified:[4]			
Reported	4,610	29,100	6.32
Estimated	2,910	19,100	6.56
Total or average	11,100	73,600	6.61

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sand.

[3] Includes snow and ice control, filtration, and golf course.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	364	2,760	1,090	6,780	1,020	8,050
Asphaltic concrete aggregates and other bituminous mixtures	--	--	404	3,260	84	910
Road base and coverings	W	W	281	1,220	W	W
Fill	28	214	132	745	4	30
Other miscellaneous uses[3]	20	174	14	455	161	730
Unspecified:[4]						
Reported	2,300	14,800	804	4,620	1,510	9,740
Estimated	1,100	7,210	1,500	9,830	315	2,070
Total	3,810	25,100	4,230	26,900	3,090	21,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

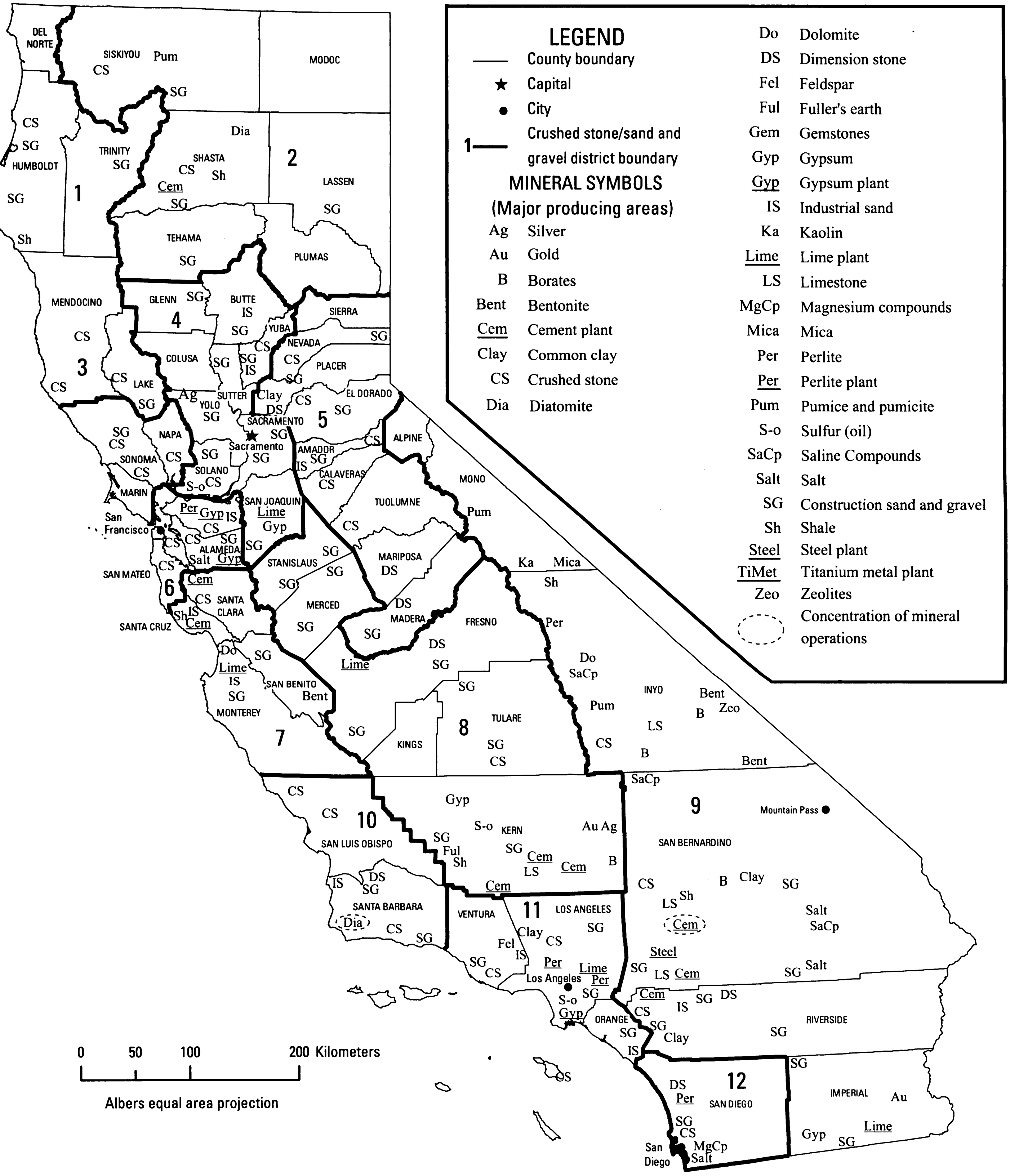
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes snow and ice control, filtration, and golf course.

[4] Reported and estimated production without a breakdown by end use.

CALIFORNIA



Source: California Department of Conservation, California Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Geological Survey for collecting information on all nonfuel minerals.

In 2006, California's nonfuel raw mineral production[1] was valued at $4.59 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $310 million increase, or up 7.2%, from the State's total nonfuel mineral value in 2005, which then had increased by $520 million, or up nearly 14%, from that of 2004. The State was third in rank among the 50 States in total nonfuel mineral production value in 2006, having been second in 2005 following 6 consecutive years (1999–2004) as first in the Nation. California accounted for 6.9% of the U.S. total.

Industrial minerals accounted for more than 99% of California's nonfuel mineral value; the remaining value resulted from gold, silver, and iron ore mining (descending order of value). In 2006, California continued as the leading construction sand and gravel-producing State, accounting for more than 11.5% of the commodity's total U.S. mine production and nearly 18% of the Nation's total value for that mineral commodity. Construction sand and gravel was, by value, also the State's leading nonfuel mineral, accounting for 33% of the State's total nonfuel mineral production value. Cement (portland and masonry) was the second ranked nonfuel mineral, followed by boron minerals, crushed stone, soda ash, and diatomite; these six accounted for 95% of the State's total industrial mineral value (table 1).

In 2006, increases in the values of crushed stone (up by $153 million), construction sand and gravel (up by $80 million), portland cement and masonry cement (up by a combined $69 million), and soda ash (up by more than $15 million) led California's significant increase in nonfuel mineral production value for the year. The production of each of these commodities showed relatively small-to-only-slight decreases in production, indicating higher overall unit values for each, especially in those of crushed stone and soda ash. Smaller yet significant increases took place (in descending order of change) in the values of boron, gypsum, and salt. The unit values of the latter two mineral commodities showed significant increases. The largest decreases in value for the State's nonfuel mineral commodities were in those of gold, common clays, and diatomite. Smaller yet significant decreases took place in the values of lime and industrial sand and gravel (table 1).

California continued to be the Nation's only State to produce boron in 2006 and remained first in the quantities of construction sand and gravel produced (listings in descending order of value). The State also continued to rank first of four diatomite-producing States; second among two States that produced soda ash; second in masonry cement; third in feldspar and in pumice and pumicite; fourth in industrial sand and gravel and gemstones (gemstones based upon value); fifth in perlite and magnesium compounds; eighth in bentonite, and ninth in salt. California rose to third in the production of fire clay in 2006 following no production in 2005, while also increasing in rank to fourth from fifth in crude gypsum, to sixth from seventh in fuller's earth, to seventh from eighth in gold, and to eighth from ninth in dimension stone. Additionally, California was a significant producer of crushed stone and common clays. The only decrease in production ranking was in that of portland cement, to second from first.

The following narrative information was provided by the California Geological Survey[2] (CGS).

Commodity Review

Industrial Minerals

Boron.—U.S. Borax (a subsidiary of Rio Tinto Minerals, London, United Kingdom), led the State and the World in the production of borates at its Boron Mine in Kern County. Boron ranked third in value of the minerals produced in the State during 2006.

Cement.—Masonry cement combined with portland cement ranked second in the production value of mineral commodities, increasing by about 10.6% compared with that of 2005 to $1.3 billion. Production in 2006 reached 11.7 million metric tons (Mt), a modest increase compared with that of 2005. Modernization of the TXI Oro Grande cement plant and mining and crushing facilities in San Bernardino County was begun in late 2005. The $360 million, 2-year project of Texas Industries, Inc., Dallas, TX, was expected to nearly double the yearly cement processing capacity from 1.1 to 2.1 Mt.

Mitsubishi Cement Corp., Lucerne Valley, continued work toward mitigating any environmental impact of the expansion at its Cushenbury Limestone quarry in San Bernardino County. The 81-hectare (ha) expansion, approved in October 2004, added 45 Mt of cement-grade limestone to the company's existing reserves at the site.

Rare Earths.—Molycorp, Inc.'s Mountain Pass Mine, San Bernardino County, remained closed in 2006. The rare-earths mine and ore processing plant were kept on care-and-maintenance status, but the company planned to initiate efforts toward reopening of these facilities. Molycorp continued to process stockpiled intermediate concentrates to mixed rare-earth compounds during the year, but the compound separation facility remained closed.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Susan Kohler, Senior Engineering Geologist, authored the text of information submitted by the California Geological Survey.

Sand and Gravel, Construction.—Production of construction sand and gravel reached 153 Mt in 2006, leading all industrial mineral in terms of value at an estimated $1.5 billion. Vulcan Materials Company, Birmingham, AL, led the State in the production of sand and gravel.

During the year, Hanson Aggregates, San Diego, began mining the 56-ha expanded region of its Sunol sand and gravel operation in Alameda County. Hanson had purchased the Sunol Mine from Mission Valley Rock Company Inc. in mid-2005. The expansion effectively added 35 Mt of construction sand and gravel reserves to the south San Francisco Bay region, an area in which aggregate demand exceeded supply.

A revised environmental impact report (EIR) was submitted to Tulare County for Kaweah River Rock Company's proposal to mine 113 ha of land south of the company's existing sand and gravel operation. In 2005, a superior court ruled that the EIR prepared for the project had failed to adequately address environmental issues. The EIR was undergoing further public review at yearend, with the Board of Supervisors scheduled to make its decision on the revised EIR by spring 2007. If approved, Kaweah River Rock expected to begin mining in the new area by July 2007. The mine expansion was expected to add about 14 to18 Mt of alluvial sand and gravel reserves to the northern Tulare County area.

The Madera Ranch Quarry project in Madera County was approved in October 2006. The permit allowed for approximately 41 Mt of construction sand and gravel to be mined during a period of 50 years. According to the permit, production was to be limited to about 820,000 metric tons per year. Sand and gravel mined at the site was to be marketed mainly in the Madera and Fresno areas. In addition to mining, the Madera Ranch operation was to include an asphaltic concrete plant.

Granite Construction, Inc., Watsonville, began mining and processing aggregate in June 2006 at its Handley Ranch Quarry, about 24 kilometers (km) southeast of Salinas in Monterey County. The permit, approved in 2004, allowed for about 109 Mt of construction grade aggregate to be mined during a period of 113 years.

Canyon Rock Co., Inc., Forestville, was granted a permit in December to expand by 13 ha the mining area at its Canyon Rock Quarry in Sonoma County. The new permit allowed for an additional 13.6 Mt of construction sand and gravel to be mined during a period of 20 years. Canyon Rock planned to begin construction on a new processing plant in late 2007.

In November, a State appellate court reversed a 2004 superior court ruling that had halted the plans of Teichert Inc., Woodland, to establish a 282-ha aggregate mine and processing plant about 6 km northwest of Lincoln in Placer County. The proposed Lincoln project would provide about 64 Mt of construction sand and gravel to Placer and Sacramento Counties.

Importation of aggregate by ship and barge continued during the year from Canada and Mexico. Most of this aggregate was designated for use in the San Francisco and San Diego regions. California imported about 2.9 Mt of sand and gravel during 2006. Hanson Aggregate was the leading importer of aggregate in the State.

Stone, Crushed.—Granite Construction Company, Inc. announced plans for its Liberty Quarry project, a proposed 63-ha crushed stone quarry in southeastern Riverside County, about 4.8 km south of Temecula near the Riverside-San Diego County border. If approved, the quarry would provide approximately 245 Mt of construction aggregate to the eastern San Diego County region during the next 75 years. However, much of eastern San Diego County's available aggregate resources remained unpermitted by yearend 2006. Granite Rock Company's Wilson Quarry, San Benito County, continued to be California's leading crushed stone mine in 2006.

San Benito Supply Inc., Hollister, began mining its Hidden Canyon Rock Quarry near Greenfield, Monterey County, which had been approved in March 2005. The permit allowed for about 6 Mt of crushed granite and 3 Mt of decomposed granite to be mined during a period of 20 years.

Metals

Gold.—Although gold prices continued to increase during 2006, the State's gold production continued to decline during the year. Annual production totaled about 1,000 kg (32,000 troy ounces), a 50% decrease compared with production in 2005.

Western Goldfields Inc. continued production from leach pads at its Mesquite Mine, Imperial County. Mining had ceased at Mesquite in 2001 when gold prices were declining, and mining had become unprofitable. Western had purchased the property from Newmont Mining Corporation, Denver, CO, in 2003, and since then had continued efforts to reopen and expand the mine. In preparation for reopening, the company made a commitment of $67 million for the purchase of a fleet of vehicles, and also committed $30.9 million to upgrade the plant and infrastructure, including construction of new leach pads. The company expected stripping operations to resume in June 2007, and the first ore to be placed on leach pads by January 2008. Full production was anticipated by April 2008. Once in full operation, annual production of about 5,100 kg (165,000 troy ounces) was considered likely. Drilling results during the first half of 2006 confirmed gold reserves of 73,400 kg (2.36 million troy ounces). Western Goldfields anticipated a substantial increase in reserves upon completion of a 21,000-meter (m) drilling program initiated in September 2006.

Canyon Resources Corporation, Golden, CO, continued feasibility studies toward restarting both open pit and underground mine operations at its Briggs Mine, Inyo County. Mining had ceased at the Briggs property in 2004. Canyon Resources' studies included exploratory drilling on two high-grade underground mining targets associated with the Goldtooth Fault and an open pit target located between the previously mined Briggs North and Goldtooth pits. Proven reserves for these deposits were estimated to be about 4,000 kg (130,000 troy ounces). Canyon Resources also explored the nonpermitted Cecil R property, located about 6 km north of the Briggs Mine. Six holes totaling 620 m were drilled during the year. Information obtained from this drill program, coupled with prior drilling results from the area, showed an estimated 5.20 Mt of gold ore averaging 0.81 gram per metric ton (0.024 troy ounce per short ton). In July 2006, Canyon Resources acquired the Suitcase and Mineral Hill properties, also nonpermitted, near the Cecil R property. Previous exploration results obtained from these properties by several companies had delineated favorable gold ore zones.

Sutter Gold Mining Inc., Riverton, WY, conducted a $1.2 million, 5,500-m drilling program during the year at its Sutter Gold project, Amador County. Results from this program were expected to be released in early 2007. The project area consists of about 220 ha along a 5.2-km segment of the Mother Lode belt and includes the historic Lincoln Mine. In 2005, Sutter Gold Mining Company had been granted its last major permit necessary to begin mining at the property. The company was awaiting an evaluation of the drilling program results and subsequent financing before mining commenced.

Emgold Mining Corporation, Vancouver, British Columbia, Canada (a subsidiary of Idaho Maryland Mine Corporation) continued its permitting process during 2006 to reopen the historic Idaho Maryland Gold Mine located in Grass Valley, Nevada County. A major permitting milestone was met in 2006 when the master environmental assessment (MEA) for the mine was completed for the city of Grass Valley. Emgold's principal focus was to address some of the environmental issues raised in the MEA. Two workshops were held during the year to educate the public and to gain local support for the project. The Idaho Maryland Corporation identified measured and indicated resources of 14,700 kg (472,000 troy ounces) of gold. A key component of the proposed Idaho Maryland Mine project is an onsite manufacturing facility that would use waste rock for the production of ceramic products.

In addition to the above-mentioned mines, placer gold was produced as a secondary mineral at several sand and gravel mines operated mainly in the northern and central part of the State. California also produced specimen gold at several small underground gold mines.

Other Metals.—Silver production made up less than 1% of California's total metal production. All the silver produced in California was a byproduct of gold production. Iron ore mined in California was used in the production of portland cement and was considered an industrial mineral.

Government Legislation and Programs

State and Local Legislation.—Californians approved a $19.9 billion transportation bond measure (proposition 1B) in November 2006 that likely would increase the State's demand for construction aggregate and portland cement throughout the next 10 years. Revenue from the sale of the bonds was to be used for safety improvements and repairs to State highways, upgrades to freeways to reduce congestion, repairs to local streets and roads, improvements to the seismic safety of local bridges, and expansion of public transit. One billion dollars of the bond revenue was to be specifically earmarked for improvements in the Route 99 corridor in the San Joaquin and Sacramento Valleys. The bond measure also authorized State and regional agencies to engage in public and private partnerships to attract additional revenue in private investment for further development of the transportation infrastructure within the State.

The California Geological Survey.—The CGS completed an updated statewide aggregate resource map in December 2006 (CGS Map Sheet 52, updated 2006, Aggregate Availability in California). The map and report compare projected aggregate demand for the next 50 years with existing permitted aggregate resources in 31 regions of the State. These 31 regions cover about 25% of the State and provide aggregate for about 90% of California's population. The map also shows aggregate production areas and highlights regions where there are less than 10 years of permitted aggregate resources remaining. A report provided with the map discusses supply and demand status of the State's permitted aggregate resources, aggregate quality and use, aggregate prices, and transportation issues. The map and report are available on line at: http://www.consrv.ca.gov/CGS/minerals/mlc/index.htm.

CGS's Mineral Land Classification Project, a mandate of the State's Surface Mining and Reclamation Act of 1975, continued to provide lead agencies with mineral resource maps. These maps have proved to be of great value in land-use planning and mineral resource conservation. At yearend, CGS had completed mineral resource studies in about one-third of the State.
CGS also began aggregate classification projects in the San Bernardino and Palm Springs areas (San Bernardino County), the Claremont-Upland area (San Bernardino and Los Angeles Counties), the North San Francisco Bay area (Marin and Napa Counties) and in San Joaquin County. These reports were scheduled for completion during 2007 and 2008.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN CALIFORNIA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Boron minerals	1,210	626,000	1,150	713,000	W	W
Cement:						
Masonry	W	W	694	80,600 [e]	698	89,500 [e]
Portland	11,900	1,000,000 [e]	11,600	1,130,000 [e]	10,900	1,190,000 [e]
Clays:						
Bentonite	24	2,640	20	2,200	24	2,510
Common	1,230	20,700	1,010	16,600	744	7,640
Fuller's earth	197	W	W	W	W	W
Gemstones, natural	NA	1,070	NA	1,130	NA	1,040
Gold[4] kilograms	3,260	43,000	W	W	W	W
Sand and gravel:						
Construction	166,000	1,280,000	163,000	1,440,000	153,000	1,520,000
Industrial	1,990	55,700	2,030	60,400	1,670	57,800
Silver[3] kilograms	801	172	269	63	W	W
Stone:						
Crushed	55,300 [4]	364,000 [4]	55,200 [r]	491,000 [r]	54,900	644,000
Dimension	42	10,200	41	10,200	40	10,000
Combined values of clays [fire (2006), kaolin], diatomite, feldspar, gypsum (crude), iron ore (usable shipped), lime, magnesium compounds, perlite (crude), pumice and pumicite, salt, soda ash, stone [crushed shell (2004)], talc [crude (2004, 2006)], zeolites, and values indicated by symbol W	XX	349,000	XX	332,000	XX	1,070,000
Total	XX	3,760,000	XX	4,280,000 [r]	XX	4,590,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2

CALIFORNIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	26 [r]	21,600 [r]	$187,000 [r]	25	24,000	$282,000
Dolomite	4	705	5,150	2	94	1,000
Marble	2	W	W	1	W	W
Shell	1	W	W	1	W	W
Granite	25	13,800 [r]	126,000 [r]	28	13,500	154,000
Traprock	45	11,600	115,000	33	10,300	121,000
Sandstone and quartzite	6	3,810	24,300	7	1,990	21,200
Slate	4	319 [r]	3,220 [r]	3	286	4,760
Volcanic cinder and scoria	7 [r]	291 [r]	2,870 [r]	8	308	3,680
Miscellaneous stone	25 [r]	2,890 [r]	27,600 [r]	42	4,390	56,300
Total	XX	55,200 [r]	491,000 [r]	XX	54,900	644,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	977	24,000
Filter stone	56	739
Other coarse aggregate	143	1,120
Total	1,180	25,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	757	10,500
Bituminous aggregate, coarse	408	3,990
Bituminous surface-treatment aggregate	W	W
Railroad ballast	524	8,290
Other graded coarse aggregate	2,080	34,700
Total	3,770	57,500
Fine aggregate (-⅜ inch):		
Stone sand, concrete	164	1,010
Stone sand, bituminous mix or seal	606	6,140
Screening, undesignated	744	6,400
Other fine aggregate	286	5,020
Total	1,800	18,600
Coarse and fine aggregates:		
Graded road base or subbase	3,670	42,000
Unpaved road surfacing	347	3,450
Terrazzo and exposed aggregate	39	891
Crusher run or fill or waste	230	830
Roofing granules	446	8,380
Other coarse and fine aggregates	1,410	14,800
Total	6,150	70,300
Other construction materials[2]	448	10,200
Agricultural:		
Limestone	(3)	(3)
Poultry grit and mineral food	(3)	(3)
Other agricultural uses	(3)	(3)
Total	210	3,820
Chemical and metallurgical:		
Cement manufacture	10,600	106,000
Flux stone	(3)	(3)
Glass manufacture	(3)	(3)
Sulfur oxide removal	(3)	(3)
Total	11,000	108,000
Special:		
Asphalt fillers or extenders	(4)	(4)
Whiting or whiting substitute	(4)	(4)
Other miscellaneous uses and specified uses not listed	781	28,600
Unspecified:[5]		
Reported	11,300	124,000
Estimated	18,000	200,000
Total	29,500	321,000
Grand total	54,900	644,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes drain fields.

[3] Withheld to avoid disclosing company proprietary data; included in "Total."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[3]	39	654	69	1,180	W	W	531	12,700	149	3,140
Coarse aggregate, graded[4]	--	--	416	8,370	199	3,000	W	W	W	W
Fine aggregate (-⅜ inch)[5]	--	--	88	879	188	2,190	W	W	47	1,030
Coarse and fine aggregates[6]	W	W	W	W	W	W	1,200	15,000	407	4,850
Other construction materials[7]	--	--	--	--	--	--	367	6,470	4	207
Agricultural[8]	--	--	W	W	W	W	--	--	--	--
Chemical and metallurgical[9]	W	W	W	W	--	--	--	--	W	W
Special[10]	--	--	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--	--	--
Unspecified:[11]										
Reported	277	2,360	63	769	400	5,250	658	7,010	598	6,380
Estimated	700	8,600	110	1,100	2,800	30,000	630	6,700	980	10,000
Total	1,090	12,700	2,010	22,300	4,690	52,000	4,010	54,000	2,280	27,400

	Districts 6 and 7[2]		Districts 8 and 9[2]		Districts 10 and 11[2]		District 12		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[3]	W	W	136	2,970	161	3,610	--	--	--	--
Coarse aggregate, graded[4]	592	9,630	1,650	26,100	415	4,840	--	--	--	--
Fine aggregate (-⅜ inch)[5]	520	5,410	736	7,100	W	W	--	--	--	--
Coarse and fine aggregates[6]	846	8,990	1,010	13,400	988	10,900	--	--	--	--
Other construction materials[7]	--	--	73	3,440	4	80	--	--	--	--
Agricultural[8]	62	784	W	W	W	W	--	--	--	--
Chemical and metallurgical[9]	W	W	W	W	W	W	--	--	--	--
Special[10]	W	W	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	763	28,200	18	436	--	--	--	--
Unspecified:[11]										
Reported	2,790	31,000	3,590	36,600	433	4,490	2,430	29,700	18	149
Estimated	4,800	53,000	7,400	79,000	400	4,200	410	4,400	--	--
Total	11,200	119,000	24,200	291,000	2,560	31,600	2,840	34,000	18	149

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 6 and 7, 8 and 9, 10 and 11 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[7] Includes drain fields.

[8] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[9] Includes cement and glass manufacture, flux stone, and sulfur oxide removal.

[10] Includes asphalt fillers or extenders and whiting or whiting substitute.

[11] Reported and estimated production without a breakdown by end use.

TABLE 5
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	40,400	$417,000	$10.32
Plaster and gunite sands	2,910	36,200	12.46
Concrete products (blocks, bricks, pipe, decorative, etc.)	269	6,100	22.66
Asphaltic concrete aggregates and other bituminous mixtures	14,700	170,000	11.60
Road base and coverings[2]	9,850	98,000	9.94
Fill	6,880	54,700	7.96
Snow and ice control	8	116	15.50
Railroad ballast	13	47	3.57
Other miscellaneous uses	46	401	8.79
Unspecified:[3]			
Reported	53,300	507,000	9.51
Estimated	24,500	233,000	9.49
Total or average	153,000	1,520,000	9.96

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilizations (cement).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	144	2,380	739	7,690	W	W
Asphaltic concrete aggregates and road base materials[3]	359	3,230	1,120	11,400	W	W
Fill	19	248	2	17	66	519
Other miscellaneous uses[4]	1	14	44	346	135	1,360
Unspecified:[5]						
Reported	259	2,310	232	2,150	430	4,490
Estimated	628	6,170	1,050	10,400	221	2,180
Total	1,410	14,300	3,190	31,900	852	8,550

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	4,180	45,200	W	W	W	W
Asphaltic concrete aggregates and road base materials[3]	3,420	31,200	497	4,530	W	W
Fill	1,220	10,400	17	137	1,480	17,000
Other miscellaneous uses[4]	2	27	131	1,370	2,650	29,100
Unspecified:[5]						
Reported	21,400	220,000	1,320	12,400	4,470	49,400
Estimated	1,550	15,300	1,180	11,600	640	6,320
Total	31,800	323,000	3,150	30,000	9,240	102,000

	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	955	9,150	5,980	64,500	16,100	153,000
Asphaltic concrete aggregates and road base materials[3]	W	W	3,820	43,200	8,490	90,300
Fill	322	1,890	179	2,410	983	4,210
Other miscellaneous uses[4]	166	1,960	8	129	--	--
Unspecified:[5]						
Reported	746	9,400	5,620	53,300	8,500	76,800
Estimated	166	1,640	663	6,550	12,600	122,000
Total	2,360	24,000	16,300	170,000	46,700	446,000

	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,640	16,300	11,200	133,000	1,230	14,900
Asphaltic concrete aggregates and road base materials[3]	486	4,460	3,300	41,600	1,340	17,700
Fill	141	1,470	1,750	11,500	688	4,980
Other miscellaneous uses[4]	--	--	5	13	--	--
Unspecified:[5]						
Reported	939	8,630	7,150	57,300	630	5,910
Estimated	198	1,650	3,780	30,500	1,910	18,900
Total	3,410	32,600	27,200	274,000	5,800	62,300

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	--	--
Asphaltic concrete aggregates and road base materials[3]	--	--
Fill	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	1,610	4,380
Estimated	--	--
Total	1,610	4,380

See footnotes at end of table.

TABLE 6—Continued

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

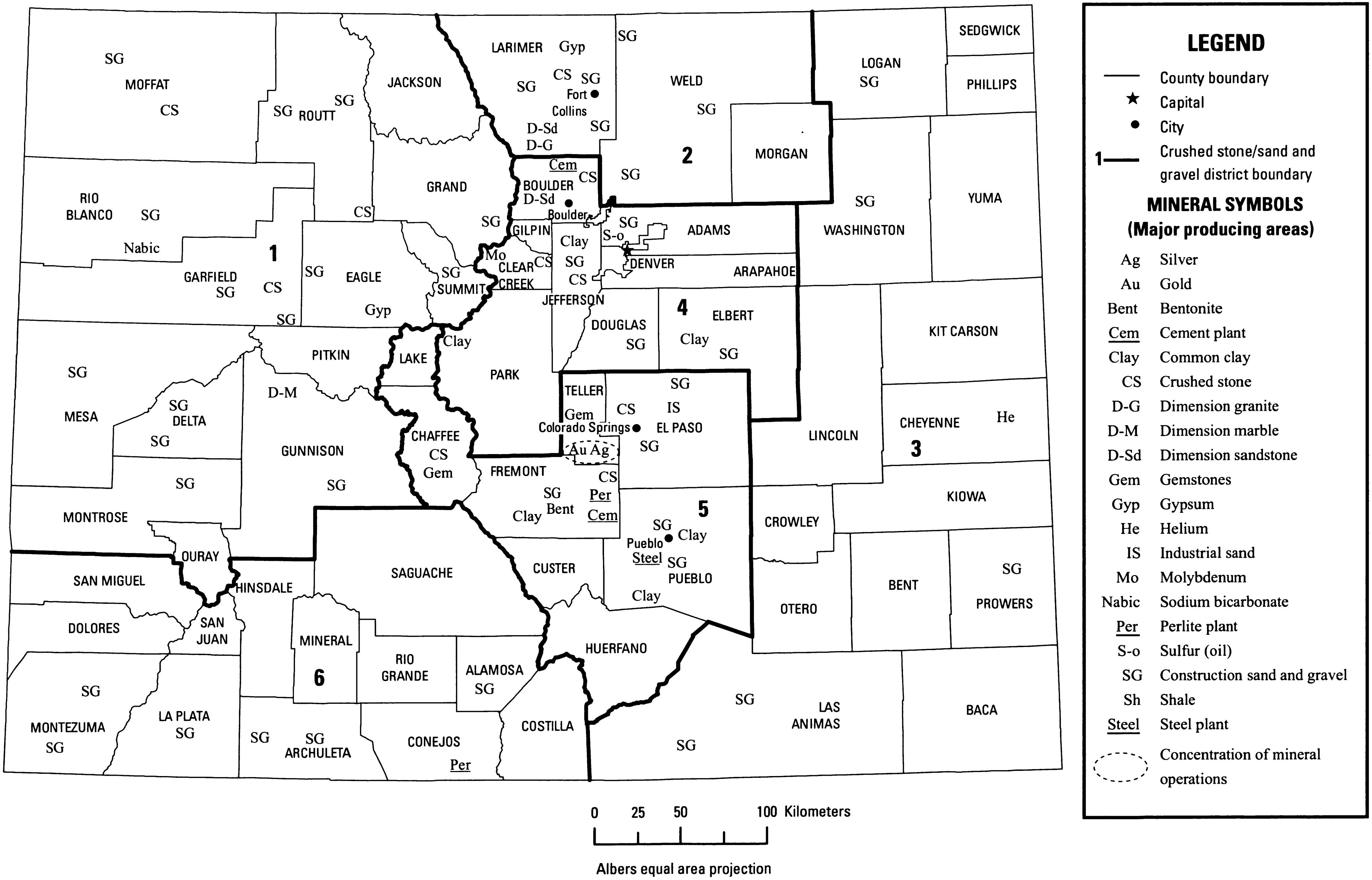
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement)

[4] Includes snow and ice control, railroad ballast, and filtration.

[5] Reported and estimated production without a breakdown by end use.

COLORADO



Source: Colorado Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 2006, Colorado's nonfuel raw mineral production[1] was valued at $1.68 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 4% decrease from the State's total nonfuel mineral production value of 2005, following a 73% increase from 2004 to 2005. Colorado was 13th in rank (10th in 2005) among the 50 States in nonfuel mineral production value, while accounting for about 2.5% of the U.S. total value in 2006.

The State's two leading nonfuel mineral commodities in 2006, by value, were molybdenum concentrates and construction sand and gravel, followed by cement (portland and masonry), gold, and crushed stone. These five commodities accounted for more than 98% of Colorado's total nonfuel raw mineral production value. The largest increases in value took place in construction sand and gravel, gold, and portland cement. A 7% increase in construction sand and gravel production led to a $47 million, or 17%, increase in the commodity's value of production. Although a small decrease took place in gold production, a significant increase in its unit value resulted in a more than $30 million rise in its production value. The production of portland cement was also down slightly, but an increase in its unit value resulted in a significant increase in the commodity's value (data withheld—company proprietary data). Smaller yet significant increases also took place in the values of produced Grade–A helium, lime, and crushed stone (table 1). The only substantial decrease in a nonfuel mineral commodity value was in the production value of molybdenum concentrates. Although molybdenum production increased by about 10% as compared with that of 2005, the total production value of molybdenum concentrates decreased by more than $150 million, owing to a drop in its unit value.

Approximately 62% of Colorado's nonfuel mineral production value in 2006 resulted from the production of metals—molybdenum concentrates, gold, and silver—in descending order of value; this was down somewhat from the recent high of 65% in 2005, following a 52% share in 2004, 30% in 2003, and 23% in 2002. Although gold, especially, also shared in the increased percentage of metals value, the largest share of the increases from 2003–06 (as compared with recent years past) mainly resulted from the significantly higher increases in the average annual prices of molybdenum concentrates.

In 2006, Colorado continued to be second in the quantity of molybdenum in concentrates produced among seven producing States and fourth of 11 gold-producing States. The State rose to seventh from ninth in construction sand and gravel production and continued to produce significant quantities (in descending order of value) of portland cement, crushed stone, crude gypsum, common clays, and gemstones (gemstones based upon value).

The following narrative information was provided by the Colorado Geological Survey[2] (CGS) and much of the data are based on its own surveys, estimates, and information gathered from company annual reports.

Exploration and Development Activities

Mineral exploration and development activity increased in 2006. New mining claims filed pertaining to mineral resources on Federal land in the State totaled 5,693. While many of these claims were likely aimed at uranium resources, interest in other mineral resources was evident.

Copper.—Constellation Copper Corporation, Lakewood, continued its interest in developing the Cashin deposit, a sandstone-hosted copper prospect in Montrose County near the Colorado-Utah border. If developed, Cashin would be a satellite operation to Constellation's Lisbon Valley Mine, located 24 kilometers (km) southwest in Utah. The Lisbon Valley Mine and processing facilities began copper production in 2006. The Cashin deposit could add several years of copper production to the Lisbon Valley operation. Constellation's consultants have estimated that Cashin contains 5.2 million metric tons (Mt) of probable ore reserves grading 0.547% copper. Copper was originally discovered in the Cashin area in 1896 and was mined from 1899 to the 1950s. Mineralization consists primarily of malachite and azurite, with chalcocite, chrysocolla, and neotocite also present. Native copper (and some native silver) was occasionally found in high-grade portions of the historic mine. Copper mineralization at Cashin is hosted by the Wingate Sandstone of Triassic age (Constellation Copper Corporation, 2006, p. 11).

Gold and Silver.—Wits Basin Precious Minerals Inc., Minneapolis, MN, continued development of the Bates-Hunter Mine in Gilpin County. Wits Basin controls the mine and mill and holds active mining and water discharge permits that would enable 64,000 metric tons per year (t/yr) of gold ore to be processed. The Bates-Hunter Mine had been a gold producing mine during the period from the 1860s to the 1930s and had been worked to the 245-meter (m) level. Many mines in the district near Bates-Hunter were producing gold mines at levels greater than 600 m. Wits Basin conducted additional drilling tests during the year and began a defined program to dewater existing mine shafts.

Calais Resources, Inc. focused on defining the mineral deposit at its Caribou Consolidated Project near Nederland, Boulder County. The deposit is located on a property that consists of an assemblage of various patented and unpatented claims and operational rights that extend more than 890 hectares (ha). Results of nearly 43,000 m of core drilling have indicated that an estimated 12,400 kilograms (kg) (400,000 troy ounces) of gold and 390,000 kg (12.5 million troy ounces) of silver are contained in the Caribou Consolidated property.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] James A. Cappa, Geologist and Chief, James Burnell, Geologist, Mineral Resources and Mapping, Colorado Geological Survey, authored the text of the State mineral industry information provided by that agency.

Minerex Corporation, Shawneetown, IL, received State and county permits to begin mining gold in the small underground Little Hope Mine north of Cripple Creek. The company had applied for permits from the State of Colorado and Teller County in 2004. It was anticipated that any gold ore mined at Little Hope would be processed at a custom mill located elsewhere. No mining was carried out in 2006.

Molybdenum.—Plans for operation of the Lucky Jack Mine (formerly known as Mount Emmons) were begun during the year. The mine consists of 25 patented and 520 unpatented mining claims covering about 2,200 ha, 8 km northwest of Crested Butte in Gunnison County. This significant molybdenum property was first discovered by Amax Inc. in 1974 on leases owned by U.S. Energy Corporation. Amax delineated a large ore body at the site reportedly containing approximately 140 Mt of mineralization averaging 0.44% molybdenite. Amax progressed toward mine development by completing nearly 61,000 m of core drilling, developing a 1,300-m drift, and constructing a water treatment plant on the property. In 2006, the property was re-acquired by U.S. Energy Corporation and Crested Corporation, at which time it was renamed the Lucky Jack Project. The companies initiated an operations plan for the mine that included using a longhole stoping mining method and a paced backfill system to minimize surface and visual impacts resulting from extraction of the ore. The goal was to have the operations plan completed in 2007, a feasibility study completed in 2008, and an environmental impact statement received in 2010. Mill construction would then begin in 2011 with operation of the mine and mill expected to begin in 2013.

Phelps Dodge Corporation, prompted by the sustained high price of molybdenum, announced plans to conduct a feasibility study on the reopening of the Climax Molybdenum Mine. The mine, located on the continental divide at Fremont Pass between Leadville and Copper Mountain, had been on care-and-maintenance status since 1995. A prefeasibility study showed that the mine would likely produce from 9,100 to13,600 t/yr of molybdenum and employ 300 workers (Keller, Carroll, and Widmann, 2006). The Climax deposit is estimated to still contain 142 Mt of ore grading 0.19% molybdenite. Phelps Dodge planned to demolish the original facilities at the mine and replace them with new structures, including a mill to process about 27,000 metric tons per day of ore. Production at the Climax Mine has been targeted to be about 10,900 t/yr of molybdenum.

In November, Freeport-McMoRan Copper & Gold Inc. agreed to acquire Phelps Dodge for about $26 billion. The merger was recommended by each company's board of directors and was to be presented for shareholder approval in the first quarter of 2007 (Metal Bulletin, 2006).

Commodity Review

Industrial Minerals

Cement.—Cemex, Inc. produced portland and masonry cement at its Boulder County cement plant. Holcim (US), Inc. continued to operate its portland cement plant near Florence in Fremont County. GCC Rio Grande, Inc. (a subsidiary of Grupo Cementos de Chihuahua) continued the planning and permitting process for a new cement plant in Pueblo. The plant is scheduled to open in 2008 and produce about 0.9 million metric tons per year of cement.

Clay and Shale.—Production of clay in 2006 decreased by 17% compared with that of 2005. Most of the clay mined in the State was common clay, used mainly to produce bricks and tiles or in the manufacture of cement and lightweight aggregate. Common clay was mined principally in eastern Colorado, especially near the Front Range in Elbert, El Paso, Douglas, Fremont, Jefferson, and Pueblo Counties. The clay was recovered mainly from the Laramie Formation (Upper Cretaceous), the Dakota Sandstone (Lower Cretaceous), and the Dawson Formation (Upper Cretaceous to Tertiary). Principal producers of clay products were Robinson Brick Co., Denver Brick Co., Summit Brick and Tile Co., and TXI Operations (Texas Industries).

Gypsum.—Producers of gypsum during the year were American Gypsum in Eagle County and Colorado Lein in Larimer County. American Gypsum operated a wallboard manufacturing plant in Gypsum, adjacent to its mine. The gypsum was excavated from evaporite deposits using a surface grinding method. Colorado Lein produced gypsum from the Permian Lykins Formation for use within the State in the cement industry.

Soda Ash.—Natural Soda, Inc. used solution mining to recover naturally occurring sodium bicarbonate from nahcolite on leases in the Piceance Basin of Rio Blanco County.

Stone, Crushed, and Sand and Gravel.—An estimated 60 Mt of construction aggregate was produced in 2006, up 4% compared with that of 2005. The value of the aggregate produced was estimated to have increased by 12% compared with that of 2005, reflecting an overall increase in the price of aggregate materials. Statewide, sand and gravel represented 80% of the total aggregate production. Aggregate Industries and Lafarge West, Inc. operated a significant portion of the aggregate production facilities within the State.

Stone, Dimension.—Granite, marble, rhyolite, and sandstone (flagstone) were the principal varieties of dimension stone produced in 2006. Approximately 18,000 metric tons of dimension and decorative stones were produced during the year, with a value of $2.4 million. The Yule Marble quarry in Gunnison County has produced a pure, white marble that has been used at the Lincoln Memorial, Washington, DC, and the Tomb of the Unknowns, Arlington National Cemetery. Red granite from the Red Rose quarry, alabaster from the Lykins formation, and Lyons sandstone each were produced in Larimer County. Colorado Quarries produced decorative and landscape stone from facilities in Chaffee, Custer, Fremont, and Teller Counties.

Metals

Gold and Silver.—Cripple Creek and Victor Gold Mining Co., (CC&V) (a subsidiary of AngloGold Ashanti, Ltd. of South Africa) operated the Cresson Mine in Teller County, the leading producer of precious metals in the State. The company processed about 5.4 Mt of ore during the year, from a reserve estimated to be about 129 Mt, containing 72,000 kg (2.33 million troy ounces) of recoverable gold. Silver also was produced as a byproduct of the gold mining.

Two smaller underground mines also produced gold in 2006. The Golden Wonder Mine in Hinsdale County mined high-grade ore from the rocks of the San Juan volcanic field. Since 2000, the Golden Wonder Mine has produced an average of 675 kg (21,750 troy ounces) per year of gold from ore grading 0.55 kg (17.9 troy ounces) per metric ton. The Cash Mine in Boulder County began producing from the Gold Hill District west of the city of Boulder at yearend. The Cash property consists of 18 former gold producing mines covering an area of about 195 ha.

Molybdenum.—Colorado remained the second leading molybdenum producing State in 2006, with more than one-fourth of the United States production derived from the Henderson Mine in Clear Creek County, operated by the Climax Molybdenum Company. Ore from the Henderson Mine was transported beneath the Continental Divide to the company's mill in Grand County by a 24-km-long conveyer. The Henderson Mine has yielded more than 150 Mt of ore that have resulted in the production of about 0.38 Mt of molybdenum. Reserves are estimated to be more than 136 Mt, containing approximately 0.23 Mt of recoverable molybdenum.

References Cited

Constellation Copper Corporation, 2006, Technical report—Cashin copper deposit: Lakewood, CO, Constellation Copper Corporation, 76 p. (Accessed July 30, 2008, at http://constellationcopper.com/art/lisbon/Constellation.Cashin.43-101.162302.KG.pdf.)

Keller, J., Carroll, C. and Widmann, B., 2006, Colorado: Mining Engineering Annual Review 2005, v. 58, no. 5, p. 75.

Metal Bulletin, 2006, Freeport McMoRan to buy Phelps Dodge for $25.9 BN: Metal Bulletin, no. 8972, November 27, p. 14.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN COLORADO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	5	W	W	W	W	40
Common	249	1,510	255	1,610	211	1,300
Gemstones, natural[3]	NA	360	NA	358	NA	261
Lime	26	2,570	29	3,900	50	5,750
Sand and gravel:						
Construction	40,900	235,000	44,700	280,000	48,000	327,000
Industrial	W	3,300	W	W	W	W
Stone:						
Crushed	11,100	68,300	13,200 [r]	90,500 [r]	12,100	88,800
Dimension	16	1,980	18	2,400	18	2,400
Combined values of cement, gold, gypsum (crude), helium (Grade–A), molybdenum concentrates, silver, soda ash (2004), and values indicated by the symbol W	XX	699,000	XX	1,380,000	XX	1,250,000
Total	XX	1,010,000	XX	1,750,000	XX	1,680,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Includes production of freshwater shell.

TABLE 2

COLORADO: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	6	1,540	$11,300	7	1,380	$13,200
Dolomite	1	42	290	1	22	209
Marble	2 [r]	W	W	1	W	W
Granite	10	6,240	42,400	10	5,630	38,900
Traprock	1	W	W	1	W	W
Sandstone and quartzite	8 [r]	4,440 [r]	30,500 [r]	8	3,990	29,200
Volcanic cinder and scoria	3	159	1,080	3	151	975
Miscellaneous stone	8 [r]	624 [r]	3,910 [r]	16	890	6,040
Total	XX	13,200 [r]	90,500 [r]	XX	12,100	88,800

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	507	6,370
Filter stone	192	1,890
Other coarse aggregate	118	513
Total	817	8,780
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	1,060	8,950
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Total	1,130	9,780
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	(2)	(2)
Other fine aggregate	129	1,530
Coarse and fine aggregates:		
Graded road base or subbase	472	1,980
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	145	251
Other coarse and fine aggregates	51	277
Total	707	2,800
Other construction materials	12	85
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Sulfur oxide removal	(2)	(2)
Special, mine dusting or acid water treatment	(2)	(2)
Unspecified:[3]		
Reported	707	4,810
Estimated	7,500	56,000
Total	8,240	61,200
Grand total	12,100	88,800

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	Districts 1, 4 and 5[3]		District 2		District 6		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[4]	799	8,650	--	--	18	130	--	--
Coarse aggregate, graded[5]	1,130	9,780	--	--	--	--	--	--
Fine aggregate (-⅜ inch)[6]	W	W	--	--	--	--	--	--
Coarse and fine aggregates[7]	703	2,770	--	--	4	26	--	--
Other construction materials	12	85	--	--	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--	--	--
Special[9]	W	W	--	--	--	--	--	--
Unspecified:[10]								
Reported	623	4,230	--	--	6	42	78	537
Estimated	7,400	56,000	103	706	--	--	--	--
Total	11,900	87,300	103	706	28	198	78	537

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 3.

[3] Districts 1, 4 and 5 are combined to avoid disclosing company proprietary data.

[4] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[5] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.

[6] Includes stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

[7] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[8] Includes cement manufacture and sulfur oxide removal.

[9] Includes mine dusting or acid water treatment.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,630	$62,700	$7.27
Plaster and gunite sands	48	470	9.74
Concrete products (blocks, bricks, pipe, decorative, etc.)	422	3,050	7.23
Asphaltic concrete aggregates and other bituminous mixtures	2,360	19,000	8.06
Road base and coverings	7,130	42,100	5.90
Road and other stabilization (cement)	90	353	3.95
Fill	1,540	7,080	4.61
Snow and ice control	179	3,060	17.07
Filtration	7	54	7.65
Other miscellaneous uses	369	2,540	6.90
Unspecified:[2]			
Reported	3,720	27,000	7.27
Estimated	23,500	159,000	6.78
Total or average	48,000	327,000	6.81

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6

COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	952	9,950	2,180	18,400	76	735	3,070	19,900	2,490	14,300	331	2,950	--	--
Asphaltic concrete aggregates and road base materials[3]	2,020	14,900	1,460	10,300	1,540	8,670	946	4,580	1,130	4,930	2,480	18,100	--	--
Fill	125	525	462	1,970	--	--	671	3,480	128	421	151	694	--	--
Other miscellaneous uses[4]	143	1,380	176	1,260	--	--	155	2,270	70	594	10	163	--	--
Unspecified:[5]														
Reported	803	11,100	898	6,030	--	--	41	371	178	448	1,220	7,930	584	1,130
Estimated	4,710	31,700	9,820	66,600	1,250	8,500	3,890	26,400	2,800	19,200	1,010	6,850	--	--
Total or average	8,760	69,600	15,000	104,000	2,870	17,900	8,770	56,900	6,790	39,900	5,200	36,700	584	1,130

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

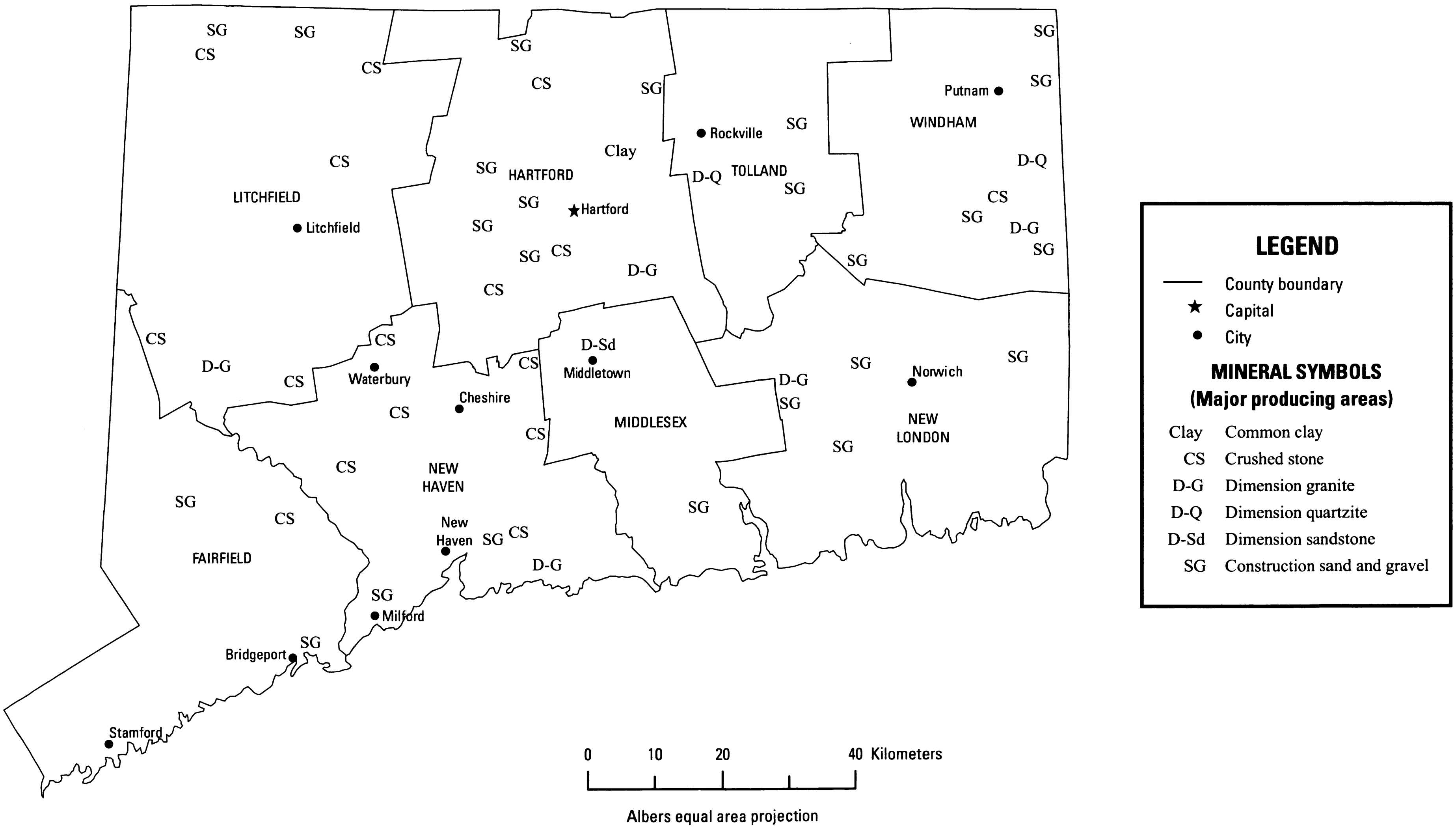
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Includes snow and ice control and filtration.

[5] Reported and estimated production without a breakdown by end use.

CONNECTICUT



Source: Connecticut Geological and Natural History Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF CONNECTICUT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Connecticut Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2006, Connecticut's nonfuel raw mineral production[1] was valued at $168 million, based upon annual U.S. Geological Survey (USGS) data. This was a more than 4% increase compared with that of 2005 and followed a nearly 23% increase from 2004 to 2005. Because data for dimension stone (mostly quartzite) and common clays were withheld (company proprietary data), the actual total values for 2004-06 are higher than those reported in table 1.

Crushed stone and construction sand and gravel, the leading nonfuel mineral commodities by value, accounted for nearly all the State's total nonfuel mineral production and value. In 2006, an $11.4 million increase in the value of construction sand and gravel more than offset a $3.8 million decrease in the value of crushed stone, resulting in the State's overall rise in production value for the year. Although construction sand and gravel production increased by nearly 5%, the commodity's total production value rose by nearly 18% because of a 13% increase in its average unit value for the year. A slight increase took place in the unit value of crushed stone but its production was down by about 5%. The value of common clay also was up, slightly, while the production and value of dimension stone and gemstones were the same as that of 2005 (table 1).

The following narrative information was provided by the Connecticut Geological and Natural History[2] Survey (CGNHS). By yearend, CGNHS records indicated that 30 bedrock stone quarries and one clay quarry were actively mining in 2006. The importance of mining information in Connecticut has increased in the past several years, with its relevancy continually emphasized through mining and minerals information requests to the CGNHS by Connecticut's Department of Environmental Protection, and the State's Office of Legislative Research, in addition to consultants, homeowners, and land speculators.

Environmental Issues

In 2006, an historic Verde Antique dimension and decorative marble mine was disturbed during the construction and expansion of a shopping mall in Milford, CT. Because of the concern about airborne asbestos (chrysotile) exposure to the construction workers, the State Department of Public Health was notified, and mitigation measures were employed to reduce airborne particulates and to cover the exposure upon completion of the construction project. The project was completed and is now an active shopping district.

Abandoned barite mines in the south-central Connecticut town of Cheshire became a substantial public issue in 2006 owing to a large 60-meter-wide sinkhole formed by land subsidence in a homeowner's yard that overlaid an old buried mine shaft. The Cheshire town attorney had previously recommended that notices about sinkhole hazards be placed on land records for areas of the town where the old mines were located. At yearend, a resolution of the matter had not yet been reached between attorneys for the homeowner with the new sinkhole and the town attorneys with regard to responsibility for mitigating the hazard. Several depressions, the new sinkhole, and a street cave-in were determined to be aligned over an old mine shaft in the town. Overall, an estimated 16 underground mine shafts are in the town under what in now considered to be reclaimed land, much of which is in residential areas.

State Government Activities

The accuracy of mining information remained a basic part of the CGNHS mission. In 2006, the agency took a renewed approach to its in-house information, in part with a small increase in staffing for the expressed purpose of assisting with quality control of the Connecticut mines database. This included work on updating Connecticut mining information to ensure accuracy of mining locations and the most current status of mining activities in all known locations. The agency review of the State's mines database included and was supplemented by fieldwork that it conducted to validate entries; the database included the tabulation of Global Positioning System (GPS) site locations.

Additionally, the CGNHS continued promoting interest in the State's Educational Mineral Collecting permit program, in which mineral clubs, museums, nature centers, and schools in the State may apply for permits to collect minerals at selected historic quarry sites on State land. A description of the program and permit application is available on the Internet (Connecticut Department of Environmental Protection, 2008).

Reference Cited

Connecticut Department of Environmental Protection, 2008, Educational mineral collecting for mineral clubs, nature centers, schools, and Connecticut museums, accessed November 13, 2008, at http://www.ct.gov/dep/cwp/view.asp?a=2701&q=323440&depNav_GID=1641.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Margaret A. Thomas, Acting State Geologist and Environmental Analyst with the Connecticut Geological and Natural History Survey, authored the text of the State mineral industry information provided by that agency.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN CONNECTICUT[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	87	(3)	89	(3)	85	(3)
Gemstones, natural	NA	6	NA	6	NA	6
Sand and gravel, construction	8,330	55,600	8,400	64,200	8,780	75,600
Stone:						
Crushed	10,100	75,700	10,500 r	96,600 r	10,000	92,800
Dimension	W	(3)	W	(3)	W (3)	(3)
Total	XX	131,000	XX	161,000 r	XX	168,000

r Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2

CONNECTICUT: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	4	1,070 r	$9,780	4	959	$8,790
Dolomite	2	644	6,390	2	661	6,260
Marble	1	46	474	1	134	1,160
Granite	7 r	630 r	5,980 r	7	640	5,720
Traprock	9	7,980	73,000	8	7,600	70,500
Miscellaneous stone	2 r	97 r	983 r	2	46	392
Total	XX	10,500 r	96,600 r	XX	10,000	92,800

r Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

CONNECTICUT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Other coarse aggregate	3	37
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	(2)	(2)
Other graded coarse aggregate	139	2,070
Total	356	3,510
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	W	W
Other fine aggregate	23	354
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Other coarse and fine aggregates	43	343
Other construction materials	9	74
Agriculture, limestone	W	W
Unspecified:[3]		
Reported	8,200	76,600
Estimated	1,100	9,900
Total	9,310	86,500
Grand total	10,000	92,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	1,010	$10,900	$10.82
Asphaltic concrete aggregates and road base materials[3]	324	3,320	10.24
Fill	359	1,410	3.93
Snow and ice control[4]	228	2,770	12.15
Unspecified:[5]			
Reported	1,540	11,800	7.64
Estimated	5,320	45,400	8.53
Total or average	8,780	75,600	8.61

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

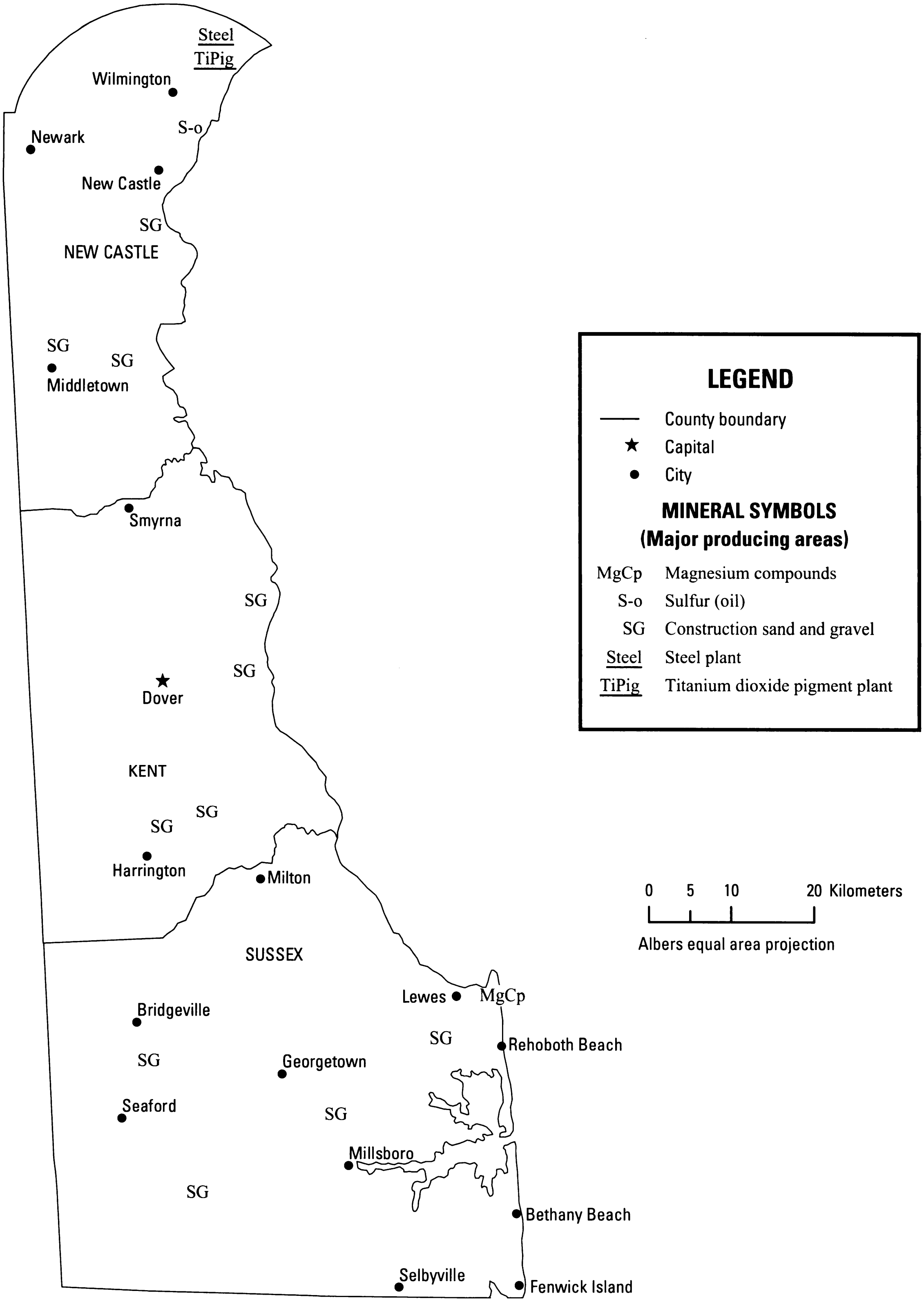
[2] Includes plaster and gunite sand.

[3] Includes road and other stabilization (lime).

[4] Includes filtration.

[5] Reported and estimated production without a breakdown by end use.

DELAWARE



Source: Delaware Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF DELAWARE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Delaware Geological Survey for collecting information on all nonfuel minerals.

In 2006, Delaware's nonfuel raw mineral production was valued at $22.4 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of 12% from that of 2005, which followed an 8.7% decrease from 2004 to 2005. Because production data for magnesium compounds and crushed stone (2005–06) were withheld (company proprietary data), the State's actual annual total values are significantly higher than those listed in table 1.

In 2006, Delaware's leading nonfuel mineral continued to be construction sand and gravel; a nearly 6% increase in production led to a 12% rise in the mineral commodity's value. This was followed by magnesium compounds, the value of which was a very significant portion of the State's actual total value. Modest increases took place in the production and related value of magnesium compounds production (table 1). In 2006, Delaware continued to rank fourth of five States in the quantities of magnesium compounds produced. Magnesium compounds, extracted from seawater close to the mouth of the Delaware Bay, near Lewes, Sussex County, were used to manufacture chemical and pharmaceutical products. Crushed stone (classified as limestone for statistical purposes) from various out-of-State sources was processed through the sales yards of Tilcon Delaware, Inc. in Kent, New Castle, and Sussex Counties. The last crushed stone production reported from a Delaware quarry was to the U.S. Bureau of Mines in 1968; the State's only stone producer ceased operations in New Castle County near Wilmington at the end of 1968 (Gustavson, 1971, p. 204). Gabbro (classified as granite for statistical purposes) was quarried and then crushed and sized as a concrete aggregate or as stone sand, while a small quantity was sold as riprap. During the previous several years, the State's crushed stone needs progressively had been fulfilled by purchases of stone from sources in Maryland and Pennsylvania (Gustavson, 1970, p. 196). All gemstones production was from that of hobbyists.

The narrative information that follows was provided by the Delaware Geological Survey[1] (DGS).

Commodity Review

Industrial Minerals

Sand and Gravel, Construction.—According to the DGS, there were at least 11 major sand and gravel production operations in Delaware. Information about sand and gravel resources and production in the State, including a map showing general locations of sand and gravel operations and graphs showing production and value from 1987–2006, is available on the Internet at the DGS Web site at http://www.dgs.udel.edu/Geology/Mineralogy/sand.aspx. The DGS estimates that the quantities of sand and gravel produced from the State's natural resources are typically higher than those reported by the USGS (table 1). Reasons for this include that (1) not all major producers report production to the USGS; (2) government agencies or companies that produce from pits for their own use do not necessarily report production; (3) some operations that mine relatively small amounts of sand and gravel are not contacted and, therefore, do not report production; and (4) production of sand from offshore areas for beach replenishment is not included in the USGS figures. For example, according to information that the DGS received from the Delaware Department of Natural Resources and Environmental Control, in 2004 and 2005 about 2.37 million cubic meters (about 3.1 million cubic yards), or approximately 3.8 million metric tons, of sand with an estimated value of $20.3 million was dredged from the Atlantic Ocean and Delaware Bay in offshore Delaware and placed on beaches along the Atlantic Coast and Delaware Bay.

Government Programs and Activities

The DGS remained actively involved in the mineral industry in Delaware through the identification and evaluation of sand and gravel resources as part of its geologic and hydrologic mapping programs, and through service on a county committee involved in evaluating and renewing applications for extractive use operations.

The U.S. Department of the Interior's Minerals Management Service (MMS) continued to provide support for studies to characterize offshore sand resources in both State and Federal waters for possible use for beach replenishment. The DGS had identified 16 areas offshore of Delaware (covering more than 28 square kilometers) to be excellent or good sand resource areas containing an estimated 140 million metric tons (80 million cubic meters) of the resource (McKenna and Ramsey, 2002, p. 7–8). Exploration and evaluation activities continued in 2006.

The DGS continued to operate and maintain the "DGS Atlantic Outer Continental Shelf Core and Sample Repository." Federal agencies, State agencies, and private institutions that recognize the value of having a centralized repository contributed samples to the repository, which contains samples from all 51 oil and gas exploratory wells drilled on the North, Middle, and South Atlantic Outer Continental Shelf between 1977 and 1984. Samples include cores, unwashed cuttings, vials containing samples processed for micropaleontology and palynology, micropaleontology and palynology slides, and thin sections of cores and cuttings. A description of the DGS repository and a summary of holdings are on the DGS Web site (Delaware Geological Survey, 2007). The DGS is designated as the primary depository for these samples by the MMS.

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[1] John H. Talley, Director and State Geologist, authored the text of the State mineral industry information provided by the Delaware Geological Survey.

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Gustavson, S.A., 1971, The mineral industry of Delaware, *in* Area reports—Domestic: U.S. Bureau of Mines Minerals Yearbook 1969, v. III, p. 203-205.

McKenna, K.K., and Ramsey, K.W., 2002, An evaluation of sand resources, Atlantic offshore, Delaware: Delaware Geological Survey Report of Investigations No. 63, 37 p.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN DELAWARE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	W	(3)	W	(3)	W	(3)
Sand and gravel, construction		2,980	21,900	2,640	20,000	2,790	22,400
Stone, crushed		--	--	W	(3)	W	(3)
Total		XX	21,900	XX	20,000	XX	22,400

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2

DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

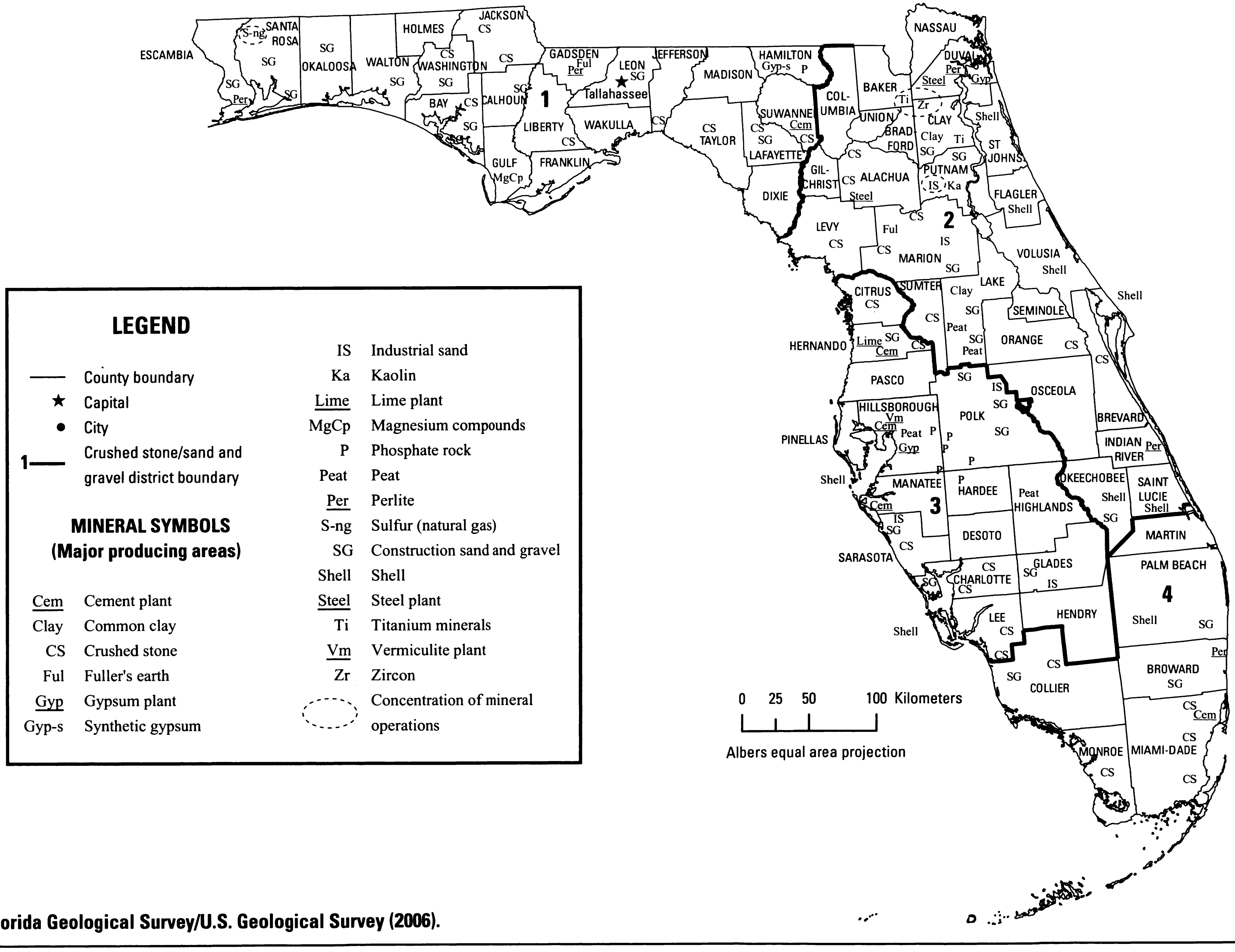
Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	W	W	W
Plaster and gunite sands	W	W	W
Fill	396	$1,650	$4.16
Other miscellaneous uses	387	3,630	9.37
Unspecified:[2]			
Reported	978	9,160	9.37
Estimated	1,030	7,920	7.72
Total or average	2,790	22,400	8.02

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

FLORIDA



Source: Florida Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 2006, Florida's nonfuel raw mineral production[1] was valued at $3.22 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $310 million, or a 10.7%, increase from the State's total of $2.91 billion in 2005, which was up $590 million, or more than 25%, from that of 2004. The State was fifth in rank (fourth in 2005) among the 50 States in total nonfuel mineral production value, of which the State accounted for nearly 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2006 with more than 65% of U.S. production, producing more than four times as much as the next highest producing State. Phosphate rock is produced in only four States. In terms of value, crushed stone continued as Florida's leading nonfuel mineral commodity, followed by phosphate rock, cement (portland and masonry), construction sand and gravel, zirconium concentrates, and industrial sand and gravel, the combined values of which represented 97% of the State's total nonfuel mineral value.

In 2006, increases in the values of crushed stone and cement, up by $330 million and $100 million, respectively, led Florida's increase in value for the year. Also up substantially were the value of construction sand and gravel, by $56 million, and the value of industrial sand and gravel, by $38 million. The unit values of each of the four nonfuel mineral commodities significantly increased, except industrial sand and gravel, which showed a small increase. A relatively small yet significant increase took place in the value of zircon concentrates in spite of a 15% decrease in the commodity's production. The most significant decrease in value was in phosphate rock, down by more than $150 million. Decreases that took place in ilmenite, fuller's earth, rutile, magnesium compounds, and lime were significantly less.

In 2006, Florida continued to be the only State to produce rutile (a titanium mineral) and staurolite, and it remained first in the quantity of phosphate rock, masonry cement, and peat (listed in descending order of value). While Florida continued to be 1st of two States that produced zircon concentrates, 2d in the production of crushed stone, 3d in magnesium compounds, and 4th in portland cement, it rose in rank to 10th from 11th in production of construction sand and gravel. The State decreased to second from first of two States that produce ilmenite (a titanium mineral concentrate) and to fifth from fourth in the production of fuller's earth clay.

The Florida Geological Survey[2] (FGS) provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys and estimates. The FGS data may differ from some production figures reported to the USGS.

Exploration and Development

Florida's phosphate companies own hundreds of thousands of hectares (ha) of property, but only about 1,500 ha was mined in 2006. In 2006, 10 new permits were issued that added 980 ha for mining phosphate. In May 2006, The Mosaic Company, Florida's leading phosphate producer, announced indefinite closure of three of its facilities. These included the Fort Green phosphate mine, the Green Bay diammonium phosphate and monoammonium phosphate concentrates plant, and the South Pierce granular triple superphosphate concentrates plant (Mosaic Company, The, 2006a).

In 2006, the State consumed an estimated 130 million metric tons (Mt) of crushed stone aggregate. Approximately 46% of the crushed stone aggregate produced in the State was derived from the Lake Belt region of Dade County (Lampl-Herbert Consultants, 2007, p. i). Florida continued to experience progressively larger transportation distances for delivery of stone aggregates which, coupled with increasing fuel prices, elevated aggregate costs to the consumer. Owing to rising aggregate production levels and the State's rapid population growth, it was anticipated that the State's reserves might well be exhausted or in economic jeopardy in a relatively short period of time. Several factors were contributing to the concerns regarding remaining reserves. These included community and environmental antimining sentiments, preemption of mining rights because of zoning or deed restrictions, litigation-related land-use constraints, and urban sprawl over potential reserves.

Florida's mineral resources reach beyond those of terrestrial origin, especially for Florida's excessively broad continental margins in the Gulf of Mexico. FGS research on sand resources in Florida's marine waters of the Gulf of Mexico has attained recognition by such agencies as the U.S. Department of the Interior's Minerals Management Service.

Commodity Review

Industrial Minerals

Florida continued to rank among the top ten fastest growing States (9th), with the second leading gain in population as nearly 26,800 new residents were arriving monthly (U.S. Census Bureau, 2006). Owing to Florida's rapid growth, the construction industry was hampered by an inadequate supply of materials, including aggregates, cement, and steel. In 2006, the mining and processing of basic construction materials, termed gravel or crushed stone, sand, and cement from limestone or lime-rock, totaled nearly 65% of the value of all mineral resources mined in the State.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Clint Kromhout, Geologist/Environmental Specialist III, authored the text of the State mineral industry information provided by the Florida Geological Survey.

Cement.—Cement was produced in six counties during the year. In Alachua, Dade, Hernando, and Suwannee Counties, the raw materials for producing the cement clinker were acquired from domestic sources, and in Manatee County the clinker was imported. Clinker production continued to rise during the year as construction activity increased.

Clays.—Common clay, fuller's earth, and kaolin were mined in several locations within the State in 2006. Common clay was mined primarily in Clay and Lake Counties, although it was mined in lesser quantities from various other locations throughout the State. Clay is used mainly in the production of brick and cement, and in the production of light aggregate for use in construction. Fuller's earth (attapulgite) was mined solely in Gadsden County and is typically used as an absorbent material in pet waste products. Kaolin was mined solely in Putnam County and is used in the manufacture of paper and refractories.

Phosphate Rock.—In 2006, three companies, CF Industries, Inc., PCS Phosphates, and The Mosaic Company, conducted phosphate rock mining at seven mines in Hamilton, Hardee, Hillsborough, Manatee, and Polk Counties. The State's operating mines represented 66% of the domestic phosphate rock mining capacity. Overall company sales of phosphate products declined slightly during the year compared with that of 2005, as a result of mine and fertilizer plant closures, lower export sales, and higher production costs and natural gas prices, effectively reaching a 40-year low in phosphate rock production (Jasinski, 2007).

Metals

Titanium and Zirconium.—E.I. du Pont de Nemours & Co., Inc. and Iluka Resources, Inc. continued to operate heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties. In late 2006, Iluka Resources ceased mining at its Green Cove Springs operation, owing to an increase in operating costs and a decline in deposit grade (Gambogi, 2008a). The company continued to process stockpiled tailings, rich in zircon (zirconium silicate), from its Green Cove Springs Mine. However, Iluka's production of zircon concentrate in the State during the year decreased by 48% compared with that of 2005 (Gambogi, 2008b). Ilmenite, leucoxene, and rutile minerals found in the heavy-mineral sand deposits of northeastern Florida are the primary raw materials used in the manufacture of titanium dioxide pigments. Zircon is used mainly in refractories and foundry sands, and in ceramics for opacification.

Environmental Issues and Reclamation

The Mosaic Company received mining permits for its proposed Altman and Ona phosphate rock mine locations along the Charlotte Harbor National Estuary, the Horse Creek, and the Peace River in Charlotte County (Mosaic Company, The, 2006b). The county had been concerned about the environmental impacts of phosphate mining on creeks, groundwater, and rivers. Legal challenges to the receipt of the permits were dropped after changes to the mining permit request were offered by The Mosaic Company, and monetary constraints had limited the county's continuance of the challenges. The Mosaic Company owned approximately 138,000 ha of land in the State, of which between 41,000 ha and 61,000 ha had been mined.

As a result of the environmental concerns on phosphate rock mining voiced in Charlotte County, the counties of Lee, Manatee, and Sarasota joined with Charlotte County in collectively urging for an area-wide environmental impact statement (EIS) to assess the vulnerability of the surrounding creeks, groundwater, and rivers. Manatee County was particularly interested in the completion of an EIS, after The Mosaic Company had proposed expanding its Four Corners Mine to include the 830-ha Altman tract. Mosaic owns approximately 4,500 ha of land in Manatee County.

The Florida Department of Environmental Protection (FDEP), Bureau of Mine Reclamation, issued 25 nonphosphate permits during the year. Most were environmental resource permits and wetland resource permits that pertained to upland and wetland disturbance and involved about 8,700 ha of land. Some permits also were issued pertaining to mine expansions and modifications.

FDEP records indicated that about 67% of the nearly 72,000 ha of land mined for phosphate since July 1, 1975, had been reclaimed. As of that date, the FDEP had required that all mined lands be reclaimed and that such reclamation be administered by the FDEP's Bureau of Mine Reclamation.

In response to a 2002 lawsuit, further challenging the impacts posed by limerock (crushed stone aggregate) mining in the Dade County Lake Belt region, the U.S. District Court in Miami ordered a reassessment of the mining permits issued for about 2,200 ha of wetlands. Environmental groups had challenged the mining permits issued for this region, arguing that the EIS prepared by the U.S. Army Corp of Engineers and the U.S. Fish and Wildlife Service had not adequately assessed danger posed to Miami-Dade County's drinking water supply and Everglades' wetland habitats. Environmental arguments were further emphasized after benzene was detected in the Miami-Dade County well field in 2005. The challenging environmental groups indicated the possibility that the benzene originated from petroleum-based explosives utilized during the mining process. A supplementary EIS reassessing the issuance of the mining permits was expected to be completed in about 18 months.

Government Programs

The FGS, through a cooperative agreement with the U.S. Department of the Interior's Minerals Management Service (MMS), investigated offshore sand sources suitable for restoration of beaches off Florida's northeast coast. The investigation was in response to a request by MMS to conduct a reconnaissance study offshore from the Eglin Air Force Base to identify desired sands. A report issued on this investigation included seismic data and representative track lines, maps, grab sample locations, descriptions, and granularmetric data for the area in federal waters offshore in Okaloosa County, FL (Phelps and others, 2007).

In response to the legal challenges by environmental groups arguing that mining will endanger Miami-Dade County's drinking water supply and Everglades' wetland habitats, the Florida Department of Transportation contracted for a study to assess the status of Florida's aggregate resources. Addressed in this study were two key questions: 1) What is the future of aggregate material supply in Florida? and 2) What are the potential impacts to Florida's economy from the curtailment of crushed stone production? The study specifically addresses the physical and economic impact should any or all of the Lake Belt aggregate mines be closed (Lampl-Herbert Consultants, 2007).

The FGS continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the FGS completed geologic mapping for the western portion of the USGS 1:100,000-scale Lake City quadrangle. The completed products included a geologic map, cross sections, and a physiographic regions map. Four cores and numerous hand samples were archived in the FGS State Geologic Sample Repository for future reference. The completed maps and cross sections are available as part of the FGS Open-File Map Series (Green and others, 2006).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	763	97,600 [e]	902	129,000 [e]	900	146,000 [e]
Portland	5,230	432,000 [e]	5,730	519,000 [e]	5,880	602,000 [e]
Clays:						
Common	W	W	4	W	3	W
Fuller's earth	234	W	279	39,700	259	24,400
Kaolin	31	3,280	29	3,510	23	2,900
Gemstones, natural	NA	1	NA	1	NA	1
Lime	24	2,090	23	2,940	W	W
Peat	478	9,710	464	9,450	496	10,000
Sand and gravel:						
Construction	29,300	146,000	37,500	210,000	40,000	266,000
Industrial	679	8,520	715	9,410	3,340	46,500
Stone, crushed	105,000 [3]	680,000 [3]	116,000 [r, 3]	1,010,000 [r, 3]	127,000	1,340,000
Combined values of magnesium compounds, phosphate rock, staurolite, stone [crushed sandstone (2004–05)], titanium concentrates, zirconium concentrates, and values indicated by the symbol W	XX	945,000	XX	971,000 [r]	XX	786,000
Total	XX	2,320,000	XX	2,910,000 [r]	XX	3,220,000

[e] Estimated. [r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	88 [r]	111,000 [r]	$980,000 [r]	80	117,000	$1,250,000
Dolomite	4	982	7,370	4	713	6,770
Shell	4	4,040	24,000	5	8,640	73,900
Sandstone	2	230	2,210	2	312	3,400
Total	XX	116,000 [r]	1,010,000 [r]	XX	127,000	1,340,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	154	2,870
Filter stone	W	W
Other coarse aggregate	1,750	26,700
Total	1,910	29,500
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,310	57,200
Bituminous aggregate, coarse	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	7,930	129,000
Total	11,600	190,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Screening, undesignated	1,570	20,600
Other fine aggregate	6,560	87,200
Total	8,130	108,000
Coarse and fine aggregates:		
Graded road base or subbase	12,700	76,900
Crusher run or fill or waste	3,740	19,100
Other coarse and fine aggregates	4,680	50,900
Total	21,100	147,000
Agricultural:		
Limestone	(4)	(4)
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	121	465
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Lime manufacture	(4)	(4)
Unspecified:[5]		
Reported	51,400	560,000
Estimated	27,000	280,000
Total	78,700	841,000
Grand total	127,000	1,340,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2[2]		Districts 3 and 4[2]		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	18	440	1,890	29,100	--	--
Coarse aggregate, graded[4]	857	17,500	10,800	173,000	--	--
Fine aggregate (-⅜ inch)[5]	946	15,000	7,170	92,800	9	104
Coarse and fine aggregates[6]	11,700	70,900	9,330	75,200	55	782
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	W	W	W	W	396	4,420
Unspecified:[9]						
Reported	8,100	88,800	43,300	472,000	--	--
Estimated	3,600	39,000	24,000	240,000	--	--
Total	26,600	236,000	100,000	1,100,000	460	5,310

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2, 3 and 4 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[7] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8] Includes cement and lime manufacture.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5

FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,620	$76,600	$7.96
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	1,690	13,500	7.96
Asphaltic concrete aggregates and other bituminous mixtures	748	5,900	7.89
Road base and coverings	1,500	12,500	8.32
Fill	4,860	20,400	4.20
Other miscellaneous uses	1,820	9,680	5.32
Unspecified:[3]			
Reported	8,390	53,300	6.35
Estimated	11,400	74,100	6.50
Total or average	40,000	266,000	6.64

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		Districts 2 and 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	624	2,630	10,700	87,500	--	--
Asphaltic concrete aggregates and road base materials	--	--	2,250	18,400	--	--
Fill	187	636	4,140	16,600	531	3,160
Other miscellaneous uses	127	980	1,690	8,700	--	--
Unspecified:[3]						
Reported	--	--	8,390	53,300	--	--
Estimated	4,940	32,100	5,880	38,200	576	3,750
Total or average	5,880	36,400	33,000	223,000	1,110	6,910

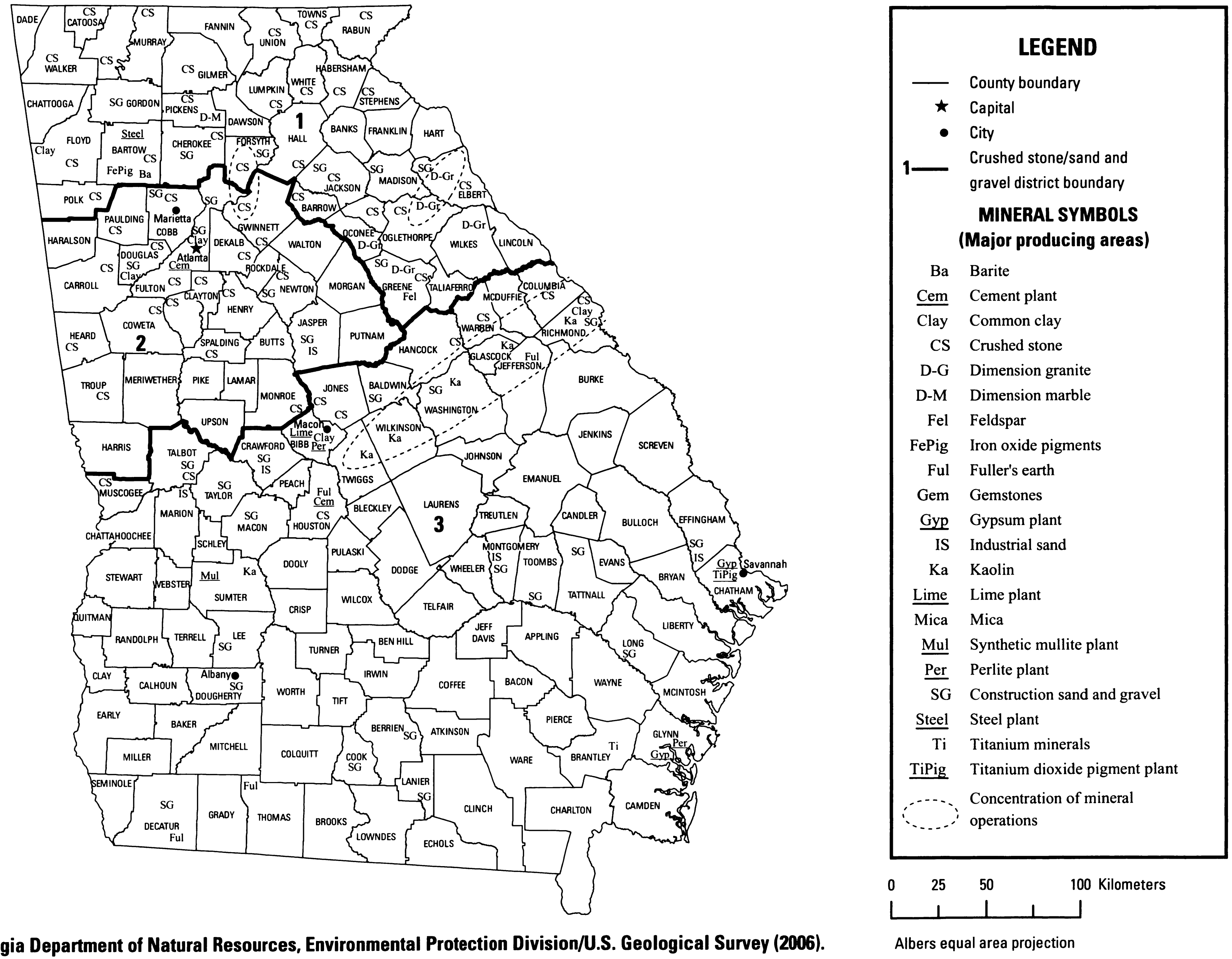
-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Reported and estimated production without a breakdown by end use.

GEORGIA



Source: Georgia Department of Natural Resources, Environmental Protection Division/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF GEORGIA

In 2006, Georgia's nonfuel raw mineral production[1] was valued at $2.08 billion, based upon annual U.S. Geological Survey data. This was a $310 million, or 17.5%, increase in the State's total nonfuel mineral value of $1.77 billion for 2005, which followed a 2.2% decrease from 2004 to 2005. For the second consecutive year, Georgia ranked ninth among the 50 States in total nonfuel raw mineral production value and accounted for more than 3% of the U.S. total.

Georgia continued to be by far the leading clay-producing State in the Nation in 2006, accounting for slightly more than 22% of total U.S. clay production (all kinds) and producing more than twice the quantity of clay as the next highest producing State. Kaolin clay remained the State's foremost nonfuel raw mineral commodity, accounting for more than 45% of Georgia's total nonfuel mineral production value and, of that, nearly 93% of its total clay value. Crushed stone was second, accounting for more than 39% of the State's nonfuel mineral value, followed by cement (masonry and portland), construction sand and gravel, and fuller's earth.

In 2006, increases in value of $185 million in crushed stone, $120 million in kaolin, and more than $20 million in cement (the majority of which was in masonry cement) accounted for the largest increases in the values of Georgia's nonfuel minerals for the year. The unit values of each of these mineral commodities also significantly increased. Crushed stone production was up by 13%, while its value rose by 29%; the value of kaolin rose by nearly 15%, despite a 4% decrease the quantity produced; and a small net decrease in cement production resulted in the commodity's large increase in value. Smaller yet significant increases also took place in the values of construction sand and gravel, feldspar, industrial sand and gravel, and lime. The largest decrease took place in the production and the value of fuller's earth clay; a 15% decrease in production resulted in an $18 million, or 22%, decrease in value from that of 2005 (table 1).

In 2006, Georgia continued to lead the Nation in the quantities of kaolin, fuller's earth clay, and iron oxide pigments produced (descending order of value). It remained second of two barite producing States, fifth in feldspar and crude mica, and eighth in masonry cement. While the State rose to fourth from sixth in crushed stone production, it decreased to fifth from second in the production of dimension stone and to fifth from fourth in common clay production. Additionally, Georgia was a significant producer of construction sand and gravel and industrial sand and gravel.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN GEORGIA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	1,550	8,710	1,530	8,730	1,510	9,150
Fuller's earth	1,400	142,000	874 [r]	82,600 [r]	747	64,300
Kaolin	6,780	898,000	7,190	825,000	6,920	945,000
Gemstones, natural	NA	9	NA	9	NA	9
Sand and gravel:						
Construction	9,270	39,400	11,100	68,300	10,900	71,000
Industrial	665	13,400	689	15,000	973	17,400
Stone:						
Crushed	79,700	548,000	80,700 [r]	631,000 [r]	90,800	816,000
Dimension	146	22,100	111 [r]	21,000	81	19,100
Combined values of barite, cement, feldspar, iron oxide pigments (crude), lime, mica (crude)	XX	134,000	XX	115,000	XX	140,000
Total	XX	1,810,000	XX	1,770,000 [r]	XX	2,080,000

[r]Revised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 2
GEORGIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	16	9,310 r	$78,100 r	17	11,300	$107,000
Marble	6	1,740	19,100 r	5	4,130	50,600
Granite	54	67,600 r	518,000 r	54	73,000	637,000
Quartzite	2	2,110	16,100	2	2,400	21,400
Total	XX	80,700 r	631,000 r	XX	90,800	816,000

r Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregate	1,730	20,700
Total	2,460	27,300
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	15,400	152,000
Total	17,000	165,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Screening, undesignated	W	W
Other fine aggregate	9,130	78,500
Total	10,300	88 000
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	595	2,680
Other coarse and fine aggregates	14,200	96,500
Total	15,500	107,000
Agricultural:		
Limestone	(2)	(2)
Other agricultural uses	(2)	(2)
Chemical and metallurgical, cement manufacture	(2)	(2)
Special:		
Mine dusting or acid water treatment	(2)	(2)
Asphalt fillers or extenders	(2)	(2)
Other fillers or extenders	(2)	(2)
Other miscellaneous uses and specified uses not listed	156	1,400
Unspecified:[3]		
Reported	37,900	340,000
Estimated	5,100	46,000
Total	43,100	385,000
Grand total	90,800	816,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	659	6,370	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W
Agricultural[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W
Special[8]	W	W	--	--	W	W
Other miscellaneous uses	--	--	--	--	156	1,400
Unspecified:[9]						
Reported	14,100	127,000	8,620	77,100	15,200	136,000
Estimated	4,200	38,000	900	8,000	--	--
Total	31,800	303,000	38,500	334,000	20,500	179,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (concrete), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6] Includes agricultural limestone and other agricultural uses.

[7] Includes cement manufacture.

[8] Includes mine dusting or acid water treatment, asphalt fillers or extenders, and other fillers or extenders.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5

GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,510	$20,200	$5.76
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	683	3,780	5.53
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W
Fill	33	156	4.73
Other miscellaneous uses[3]	46	363	7.83
Unspecified:[4]			
Reported	3,530	27,800	7.88
Estimated	3,080	18,700	6.06
Total or average	10,900	71,000	6.53

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	488	3,770	351	2,820	3,350	17,400
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--	W	W
Fill	--	--	--	--	33	156
Other miscellaneous uses[3]	36	316	--	--	10	46
Unspecified:[4]						
Reported	2,520	22,000	--	--	883	5,060
Estimated	67	407	177	1,080	2,830	17,200
Total	3,110	26,500	528	3,890	7,110	39,900

	Unspecified district	
	Quantity	Value
Concrete aggregates and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Fill	--	--
Other miscellaneous uses[3]		
Unspecified:[4]	--	--
Reported	132	758
Estimated	--	--
Total	132	758

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

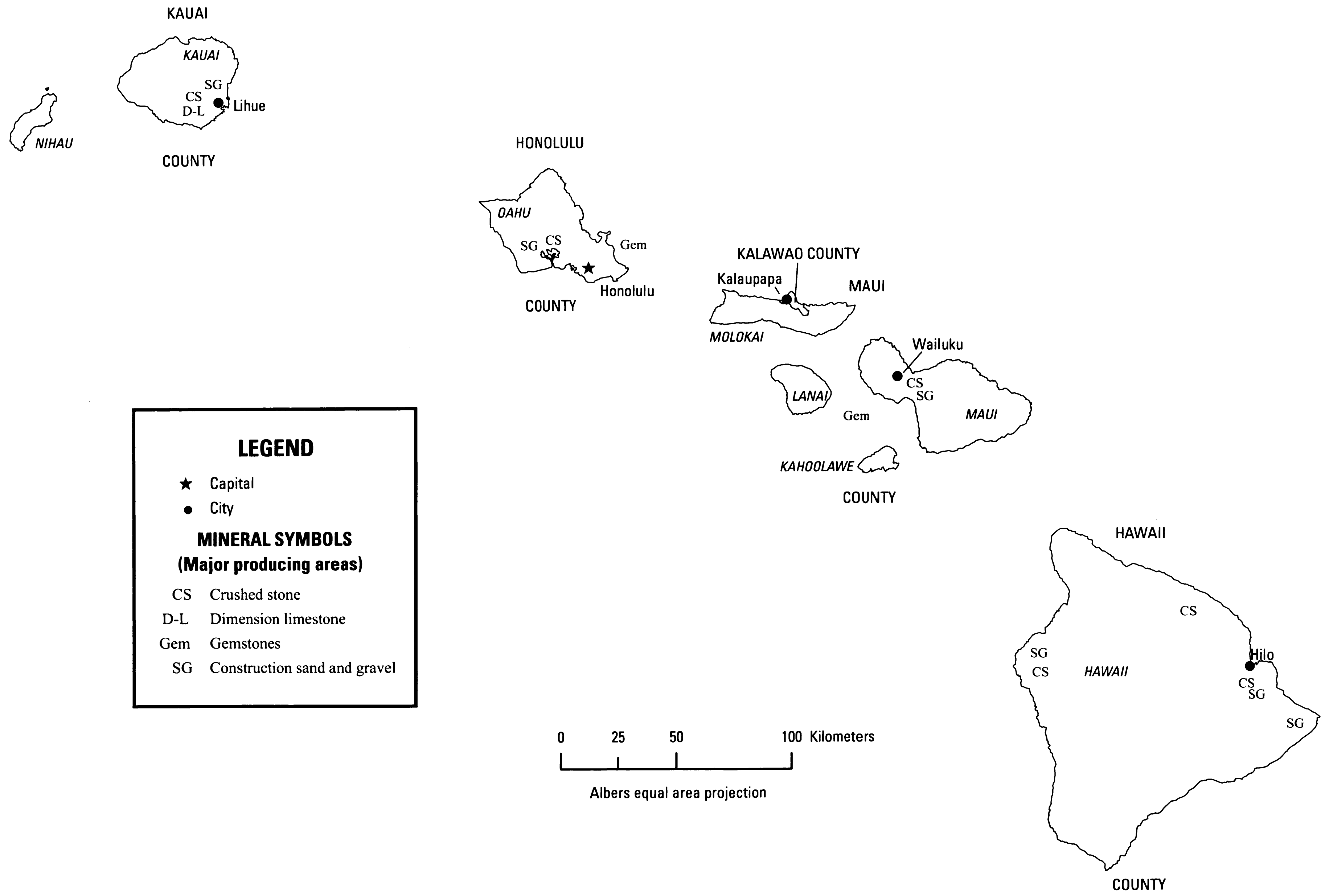
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

HAWAII



Source: Hawaii Commision on Water Resource Management/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF HAWAII

In 2006, Hawaii's nonfuel raw mineral production[1] was valued at $145 million, based upon annual U.S. Geological Survey data. This was a $20 million, or 16%, increase from that of 2005, which followed a $51 million, or nearly 70%, increase from 2004 to 2005. Mining in Hawaii consisted mostly of the quarrying of stone, used to produce crushed stone, and the extraction of sand and gravel from open pits, both commodities produced for use by the construction industry. Gemstones, in significant quantities, also were produced, mostly black coral and precious coral.

In 2006, crushed stone led the State's increase in nonfuel mineral production value, up by $22 million. Although the increase in production was relatively small, only 2%, the commodity's value rose by 21%. Similarly, in 2005, the value of crushed stone had risen even more, up by nearly $46 million, or 75%, resulting from a 50% increase in production. The State's increase in value in 2006 was partly offset by a $1.6 million decrease in the value of construction sand and gravel, the production of which was down by about 12%, unlike the changes in 2005 from those of 2004 when significant increases took place in the production and especially the values of both of the aggregates. In 2005, a 10% increase in construction sand and gravel production led to a $5.4 million, or 45% increase in its value. Although having minimal effect on the State's overall change in value, gemstones production in 2006, based upon value, decreased significantly, down by $110,000, or by 51% (table 1).

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN HAWAII[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Gemstones, natural	NA	262	NA	217	NA	107
Sand and gravel, construction	1,260	12,100	1,390	17,500	1,230	15,900
Stone, crushed	5,470	61,300	8,230 r	107,000 r	8,380	129,000
Total	XX	73,700	XX	125,000 r	XX	145,000

rRevised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

HAWAII: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	1	W	W	1	W	W
Traprock	17 r	6,400 r	$85,800 r	14	6,500	$102,000
Volcanic cinder and scoria	4	W	W	1	W	W
Miscellaneous stone	4 r	1,500 r	15,500 r	4	1,700	24,800
Total	XX	8,230 r	107,000 r	XX	8,380	129,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 3
HAWAII: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregate	106	1,720
Total	143	2,440
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Other graded coarse aggregate	407	6,860
Total	948	13,200
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Other fine aggregate	85	1,620
Total	579	13,100
Coarse and fine aggregates:		
Graded road base or subbase	290	4,200
Crusher run or fill or waste	591	4,880
Other coarse and fine aggregates	67	1,070
Total	948	10,200
Unspecified:[2]		
Reported	2,080	30,300
Estimated	3,700	60,000
Total	5,760	90,100
Grand total	8,380	129,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

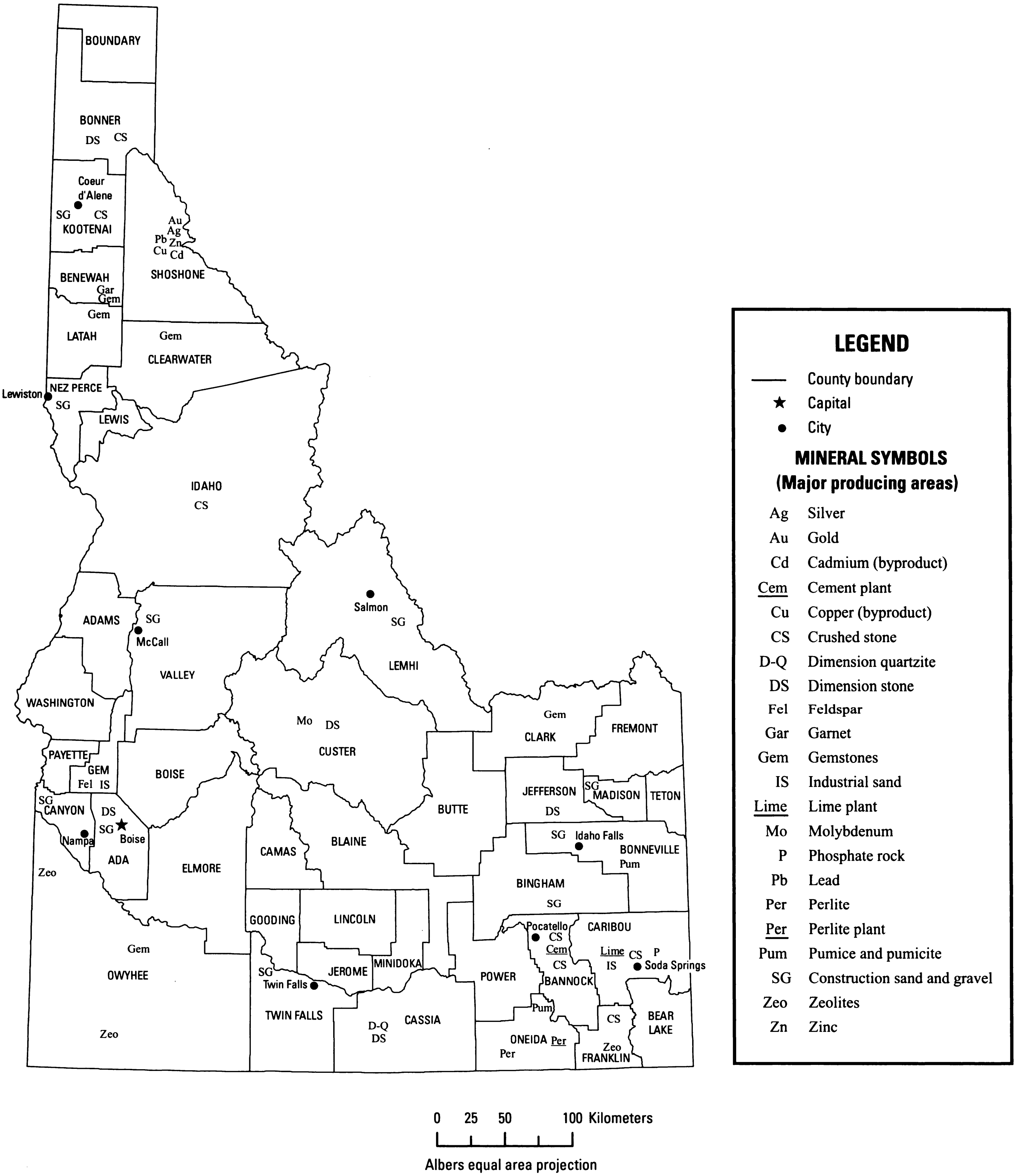
TABLE 4
HAWAII: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Fill	9	$53	$5.79
Unspecified, estimated[2]	1,220	15,800	12.95
Total or average	1,230	15,900	12.90

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

IDAHO



Source: Idaho Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF IDAHO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Idaho Geological Survey for collecting information on all nonfuel minerals.

In 2006, Idaho's nonfuel mineral production was valued[1] at $797 million based upon annual U.S. Geological Survey (USGS) data. This was a 12% decrease from the State's total nonfuel mineral value for 2005. Idaho was 27th in rank among the 50 States in total nonfuel mineral production value and accounted for 12% of the U.S. total. Yet, per capita, the State ranked eighth in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 1,470,000, the value of production was about $543 per capita.

Molybdenum concentrates, construction sand and gravel, phosphate rock, silver, crushed stone, lead, and portland cement were, in descending order of value, Idaho's leading nonfuel minerals and accounted for more than 96% of the State's total nonfuel mineral production value in 2006. Industrial minerals accounted for about 41% of the State's total nonfuel mineral value; molybdenum concentrates, silver, lead, copper, zinc, and gold (descending order of value) accounted for the remainder. In 2006, the largest increases in value took place in the values of construction sand and gravel (up $39 million), silver, and lead (descending order of change in value). Significant, though more moderate increases took place in phosphate rock, crushed stone (up $7.6 million), portland cement, lime, and zinc. But these increases were more than offset, in particular, by a substantial decrease in the value of molybdenum concentrates, and less so by decreases in the values of industrial sand and gravel, copper, and gold, leading to the State's decrease in nonfuel mineral production value for the year (table 1).

In 2006, Idaho continued to rank second of three producing States in the quantities of industrial garnet produced; third of four phosphate rock-producing States and third in silver production and lead production (descending order of value); and fourth in the production of molybdenum concentrates. The State rose to fourth from fifth in the production of pumice and pumicite and to seventh from eighth in gemstones (gemstones based upon value), but decreased to third from second in zeolite production. Idaho continued to be a significant producer of construction sand and gravel.

The Idaho Geological Survey[2] (IGS) provided the narrative information that follows. Production data in the text that follows are those reported by the IGS and are based on the agency's own surveys and estimates or information gathered from company annual reports. They may differ from production figures published by the USGS.

Higher base and precious metal prices lead to increased development and mining employment, which peaked at 2,416 in the second quarter of 2006, reflecting a 10% increase from that of 2005. The phosphate processing industry employed an additional 1,000 workers in the chemical plants in southeastern Idaho. A strong housing and commercial construction market fueled increases in value and production of sand and gravel and crushed stone. Exploration interest increased significantly in 2006.

Exploration and Development Activities

Metals

Cobalt.—Formation Capital Corporation, Vancouver, British Columbia, Canada, continued the process for development of its Idaho Cobalt Project (ICP), a new underground cobalt-copper-gold mine in the Blackbird Mining District southwest of Salmon within the Salmon-Challis National Forest. The primary activity in 2006 was preparation of the draft environmental impact statement (DEIS) by the U.S. Department of Agriculture, Forest Service. The DEIS was expected to be released in 2007. The proposed ICP project consists of a 725-metric-ton-per-day mine and mill complex, along with ancillary facilities, many of which were to be located on a high plateau to simplify construction and environmental management. Annual metal production from the mine was estimated to be about 1.3 million kilograms (kg) of cobalt, 0.9 million kg of copper, and 106 kg (3,400 troy ounces) of gold. Concentrate from the mill was to be transported by truck to Formation's hydrometallurgical plant in Kellogg for metal recovery.

Reserves at the ICP site have been estimated to be sufficient for 10 to12 years of mine life with the potential for additional reserves upon further exploration. These reserves are located in the Ram and Sunshine deposits on 145 unpatented claims immediately surrounding an original patented district. The ICP operation was expected to disturb less than 51 hectares of new mining land.

Gold.—Valencia Ventures, Inc., Toronto, Ontario, Canada, through Golder Associates Inc., an International consulting company, completed a preliminary assessment of the Buffalo Gulch deposit, a component of the Idaho Gold Project near Elk City. Toronto's Beartooth Platinum Corporation retained a 49% interest in Buffalo Gulch, an open pit deposit with an oxide resource of 4.4 million metric tons (Mt), grading 0.69 grams per metric ton (g/t) gold. The remaining components of the Idaho Gold Project consisted of three prospective gold resources in the Orogrande Shear zone. These included the Friday/Petsite, the Deadwood, and the Dixie zones. Late in 2006, the Idaho Gold

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Virginia S. Gillerman, Associate Research Geologist/Economic Geologist, authored the text of the State mineral industry information provided by the Idaho Geological Survey.

Project was sold to Clearwater Mining Corporation, a privately owned company.

In Lemhi County, Journey Resources Corp., Vancouver, British Columbia, Canada, completed an additional 3,000 meters (m) of reverse circulation drilling at the Musgrove Creek gold project, southwest of Salmon. Journey's decision to conduct further drilling was based upon earlier reports that had indicated a mineral resource at the site of about 8 Mt, grading 1.22 g/t gold. The gold was hosted in epithermal veins in the Precambrian metasediments. Results of the latest drilling indicated numerous intervals of anomalous gold with some high grade gold intercepts.

In eastern Idaho, Kilgore Minerals Ltd., Vancouver, British Columbia, Canada, drilled 10 holes, totaling 3,320 m, at the Kilgore epithermal gold system in Clark County. Previous work by Kilgore and several major mining companies outlined a 14,000-kg (450,000-troy ounce) gold resource and additional soil anomalies. The drilling in 2006 intersected anomalous alteration and low-grade gold mineralization over wide areas.

In southern Idaho, Vancouver-based Freegold Ventures Ltd. conducted a 10,000-m drill program at the Almaden gold project east of Weiser in Washington County. Prior drilling results at Almaden had identified a Canadian National Instrument (NI) 43–101-compliant indicated resource of about 17,100 kg (551,000 troy ounces) of gold. Freegold held a 100% lease on the property.

Toronto-based Atlanta Gold Inc., continued efforts to develop its open pit gold mine at Atlanta, as the company sought public input on its revised plan of operations for the mine. The Atlanta mining project had raised significant concern in Boise regarding the proposed mine's possible impacts on water quality in the Middle Fork section of the Boise River. Some delay in completing the permitting process for the mine also was encountered during the year as a result of corporate restructuring.

Molybdenum.—Vancouver-based Kobex Resources Ltd. began a drilling program at its Cumo molybdenum property in Boise County. Molybdenum mineralization was intersected over a significant portion of two drill holes totaling 1,070 m. One 500-m drill hole averaged 0.096% molybdenum sulfide (MoS_2). The Cumo deposit includes multiple intrusive porphyries and some copper mineralization. The property had been acquired by Kobex from Vancouver-based Mosquito Consolidated Gold Mines Ltd. in 2005. Cumo was discovered and explored by Amax Exploration Inc. during the 1970s and 1980s. The indicated block model resource was 1.3 billion metric tons, grading 0.093% MoS_2 in 1982.

Silver.—As the price of silver continued to rise, the Coeur d'Alene District in Shoshone County experienced a resurgence of exploration interest in the rich quartz-siderite-sulfide veins that define the Silver Valley. The Galena, Lucky Friday, and Sunshine Mines in the Coeur d'Alene District each had development projects underway during the year. At Hecla Mining Company's Lucky Friday Mine, a new access drift was completed on the 1,800-m [5,900-foot (ft)] level from the Silver Shaft to the tetrahedrite-rich Gold Hunter veins. The new drift allowed mining on both the 1,400-m (4,900-ft) and 1,800-m levels. Improvements were made to the Lucky Friday mill that included construction of a third-stage crushing circuit and an increase in flotation capacity. Diamond drilling below the 1,800-m level intersected mineralized veins near the 2,400-m (7,900-ft) level, effectively increasing the silver resource by 34% to 3.64 million kilograms (117 million troy ounces).

The Galena Mine continued to be operated after U.S. Silver purchased the mine and adjoining property from Coeur Silver Valley in June. The new company increased exploration and development, improved the mine plan, and started needed infrastructure maintenance. U.S. Silver conducted a major drilling program with nearly 18,000 m of core drilling completed during the year. Two types of high-grade mineralization zones were discovered on the 730-m (2,400-ft) level that included silver-copper and silver-lead veins. Some high-grade mineralization containing about 1,400 g/t of silver also was intersected on the 1,040-m (3,400-ft) level. Improvements were made at the nearby Coeur mill to allow for two separate metallurgical circuits.

Sterling Mining Company pursued an aggressive development program at the Sunshine Mine near Kellogg during the year. In January, the company detonated the first blast for the new Sterling Tunnel, designed to connect with the Polaris Drift-Silver Summit Tunnel and to reopen the upper workings of the Sunshine vein for mining and exploration. By yearend, an 850-m length of the 3.6-m-wide tunnel had been completed. Sterling also began refurbishing the Sunshine mill and Jewell Shaft and stations, including the power supply, pumps, and secondary mine escape shaft. In October, Sterling Mining purchased exclusive right to the Sunshine tailings facility from Essential Metals Corp., a subsidiary of Formation Capital Corporation.

New Jersey Mining Company, based in Kellogg, operated the Golden Chest Mine at Murray in Shoshone County and reported the core drilling of nine exploration holes on the Idaho vein. The company also began development of its newly permitted Silver Strand underground mine northeast of Coeur d'Alene in Kootenai County. Efforts included driving a new adit and constructing an office and water management facility. New Jersey also constructed a concentrate leach tank circuit and introduced improvements at its Kellogg mill that would enable the company to produce dore from the Silver Strand's high-grade silver-gold ore.

In other company activities, New Jersey acquired the Niagara copper-silver property near Murray in December. Prior work by Earth Resources Company in the 1970s at the Niagara deposit delineated a resource of approximately 14 Mt of ore hosted in the Revett Quartzite. New Jersey also developed the Coleman vein and staked new discoveries, including the Gold Butte and CA-Toboggan prospects near Murray.

Other Metal Projects.—Journey Resources Corp. and Calgary-based Trio Gold Corp. began an exploration program at the Empire Mine near Mackay in Custer County. Initial drill results from the AP pit area revealed an intercept of 9 m, grading 0.26% copper and 5.5 g/t gold. The Empire deposit is a polymetallic skarn containing copper, gold, silver, and zinc mineralization. A feasibility study was planned to determine the potential for use of a solvent extraction/electrowinning process to recover copper and zinc from the deposit.

Salmon River Resources, a Vancouver-based company, conducted preliminary diamond drilling at the CAS property near Iron Creek. Cobalt-bearing pyrite and arsenopyrite with appreciable gold content were discovered there in the 1970s.

Commodity Review

Industrial Minerals

Garnet, Industrial.—Gem-quality garnets and industrial garnets were produced in the State during the year. Emerald Creek Garnet (a subsidiary of WGI Heavy Minerals) mined and processed industrial grade garnets in Benewah County from areas along Carpenter and Emerald Creeks and the St. Maries River flood plain. The Idaho Panhandle National Forest received many public comments on its environmental impact statement to revamp the regulations for the recreational star garnet digging near St. Maries. New procedures included eliminating public access to the creek and constructing sluice boxes for visitors to use containing premined alluvial ore.

Phosphate Rock.—Three companies, Agrium Inc., J.R. Simplot Co., and Monsanto Co. extracted and processed about 3.6 Mt of ore from the Permian Phosphoria Formation in Caribou County in southeastern Idaho. The ore was processed locally into phosphoric acid by Agrium and Simplot for use in the agricultural chemical industry or into elemental phosphorus by Monsanto to produce other phosphorus compounds.

Monsanto continued its mining at South Rasmussen Ridge while concurrently reclaiming and backfilling the mined area. The company also conducted further studies on geology and water issues in preparation for permitting of its proposed Blackfoot Bridge Mine. Exploratory drilling also was continued at the Blackfoot Bridge site. J.R. Simplot continued mining of two pits at the Smoky Canyon Mine near the Idaho-Wyoming border while reclaiming three other pits at the mine site. Production at Smoky Canyon in 2006 was near the record level of 1.8 Mt reached in 2005. J.R. Simplot also awaited public comments on the DEIS pertaining to the expansion of the company's mining activities into two new areas located on its Manning and Deer Creek leased properties. Some issues remained to be resolved on the planned expansion regarding road access to the proposed mining areas. Agrium operated the Dry Valley Mine, which was purchased in 2004 from Astaris/FMC. Mining was primarily from one pit, while delineation drilling was carried out at a second pit area.

Stone, Dimension.—L and W Stone Corp. operated its Three Rivers quarry west of Challis in Custer County extracting approximately 23,000 to 27,000 metric tons (t) of multicolored argillaceous sandstone during the year. Oakley stone was produced from several quarries on Middle Mountain in Cassia County. Companies active in the recovery of oakley stone included American Stone, Northern Stone Supply, Oakley Valley Stone, and Scrivanich Natural Stone. At Boise, Gerhard Borbonus Landscaping and Table Rock Sandstone quarried silicified sandstone for high-end landscaping and building stone. Idaho Travertine operated a stone-cutting facility in Idaho Falls.

Other Industrial Minerals.—Ash Grove Cement operated at capacity at its Inkom cement plant in southeastern Idaho. Hess Pumice Products, Inc. produced pumice from its Wrights Creek Mine north of Malad. Most of the pumice was transported to the nearby Owens Corning plant for use in the manufacture of cultured stone for construction. Hess also produced finely ground pumice for a variety of other uses in domestic and international markets. Idaho Minerals, LLC, owned by Hess, mined perlite and expanded it for use in potting soils. Bear River Zeolite continued to produce zeolite at or above the 2005 level at its expanded zeolite mine and plant near Preston. Unimin Corporation, New Canaan, CT, produced industrial silica-feldspar sand at its operation near Emmett. Sand and gravel and crushed stone production increased compared with that of 2005, and the production level for other construction commodities remained high during the year.

Metals

Gold.—New Jersey Mining began the first full year of production at its Golden Chest Mine at Murray in Shoshone County, mining ore at the rate of about 400 metric tons per month and processing it at the company's mill in Kellogg. The Katie-Dora vein at Golden Chest contains an estimated resource of about 9,300 kg (300,000 troy ounces) of gold. One other small gold mine, the Bond Mine, located at Pierce, reported extracting an undisclosed quantity of gold during the year.

Molybdenum.—Thompson Creek Mining Co. produced approximately 7,300 t of molybdenum (contained in molybdenite concentrate) in 2006 at its Thompson Creek Mine in Custer County. Expansion of the large open pit molybdenum mine continued during the year as an additional quantity of overburden was removed as part of the sixth phase of the expansion process. In October, the privately held Thompson Creek was purchased by Blue Pearl Mining, a Canadian junior company with a molybdenum deposit in British Columbia. The sale included the Custer County open pit mine and mill, a 75% interest in the Endako Mine in British Columbia, and the metallurgical roasting plant in Langeloth, PA. Blue Pearl changed its name to Thompson Creek Metals Company, Inc. to reflect the new acquisition.

Silver.—About 130,000 kg (reported as 4.188 million troy ounces) of silver was produced at the two operating mines in the Coeur d'Alene District. Hecla's Lucky Friday unit at Mullan reported a 19% increase in silver production to more than 89,000 kg (reported as 2.87 million troy ounces) from its Gold Hunter expansion area. Byproduct lead and zinc also were produced from the Gold Hunter deposit. Silver production from the Galena Mine was about 41,000 kg (reported as 1.31 million troy ounces) in 2006. Byproduct lead and copper were also produced at Galena.

Environmental Issues and Mine Reclamation Awards

Meridian Gold's Beartrack Mine in Lemhi County won the U.S. Bureau of Land Management's National 2006 Hard Rock Mine Reclamation Award. The open pit, heap-leach gold mine west of Salmon operated from 1994 to 2000, producing approximately 22,000 kg (700,000 troy ounces) of gold. The mine was strongly supported by the local community and maintained the highest standards of environmental performance throughout its lifetime and postclosure. Reclamation work at the site was nearly complete.

Selenium contamination in mine waste remained a difficult issue for companies and agencies in the phosphate rock mining region. Samples recovered from historic mine waste dumps further emphasized the challenging problems to be faced in remediating these mine sites. As a result, new mine regulations have required the backfilling and capping of seleniferous overburden to prevent environmental releases of selenium.

Government Programs

The Idaho Geological Survey (IGS) continued its active participation in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

New digital web maps (DWMs) can be downloaded in pdf format from the IGS Web site (www.idahogeology.org). Maps released included the Deadwood, Murphy, and Orofino 100 K quadrangle geologic maps, Long Valley surficial geology, and an oil and gas drilling map. A research project of the IGS Boise Office on the Lemhi Pass Thorium-Rare Earth District was underway. More information on these and other items can be accessed on the IGS Web site.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN IDAHO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	836	NA	469	NA	388
Sand and gravel, construction	19,600	74,300	20,800	93,800	26,900	133,000
Stone, crushed	3,420	18,100	4,890 [r]	26,300 [r]	5,960	33,900
Combined values of cadmium (byproduct of zinc concentrates),[3] cement (portland), copper, feldspar, garnet (industrial), gold (2005–06), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone (dimension quartzite and sandstone), zeolites, zinc	XX	354,000	XX	788,000	XX	630,000
Total	XX	447,000	XX	908,000 [r]	XX	797,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

[3] Data not available for 2006.

TABLE 2

IDAHO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	6	504	$3,560	9	982	$6,480
Shell	1	W	W	1	W	W
Granite	10	692	3,280	15	806	3,710
Traprock	13 [r]	1,500 [r]	7,900 [r]	29	1,470	6,680
Quartzite	2	W	W	4	W	W
Miscellaneous stone	8 [r]	1,720 [r]	9,000 [r]	12	2,220	14,300
Total	XX	4,890 [r]	26,300 [r]	XX	5,960	33,900

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

IDAHO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	8	30
Filter stone	18	114
Other coarse aggregate	14	31
Total	40	175
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	221	1,370
Bituminous surface-treatment aggregate	92	459
Railroad ballast	W	W
Total	322	1,880
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Other fine aggregate	11	57
Total	47	241
Coarse and fine aggregates:		
Graded road base or subbase	1,450	5,980
Unpaved road surfacing	78	268
Crusher run or fill or waste	(2)	(2)
Other coarse and fine aggregates	96	517
Total	1,620	6,770
Agricultural:		
Limestone	(3)	(3)
Poultry grit and mineral food	(3)	(3)
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Flux stone	W	W
Total	812	3,610
Special:		
Asphalt fillers or extenders	W	W
Whiting or whiting substitute	W	W
Other fillers or extenders	W	W
Total	47	1,500
Unspecified:[4]		
Reported	2,240	14,400
Estimated	790	4,300
Total	3,030	18,700
Grand total	5,960	33,900

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4] Reported and estimated production without a breakdown by end use.

TABLE 4
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	2,410	$15,700	$6.49
Asphaltic concrete aggregates and other bituminous mixtures	1,010	6,380	6.30
Road base and coverings	6,250	30,000	4.80
Road and other stabilization (cement and lime)	76	427	5.63
Fill	1,330	4,550	3.41
Snow and ice control[3]	82	596	7.28
Other miscellaneous uses	215	922	4.29
Unspecified:[4]			
Reported	6,510	29,300	4.51
Estimated	9,040	44,800	4.96
Total or average	26,900	133,000	4.93

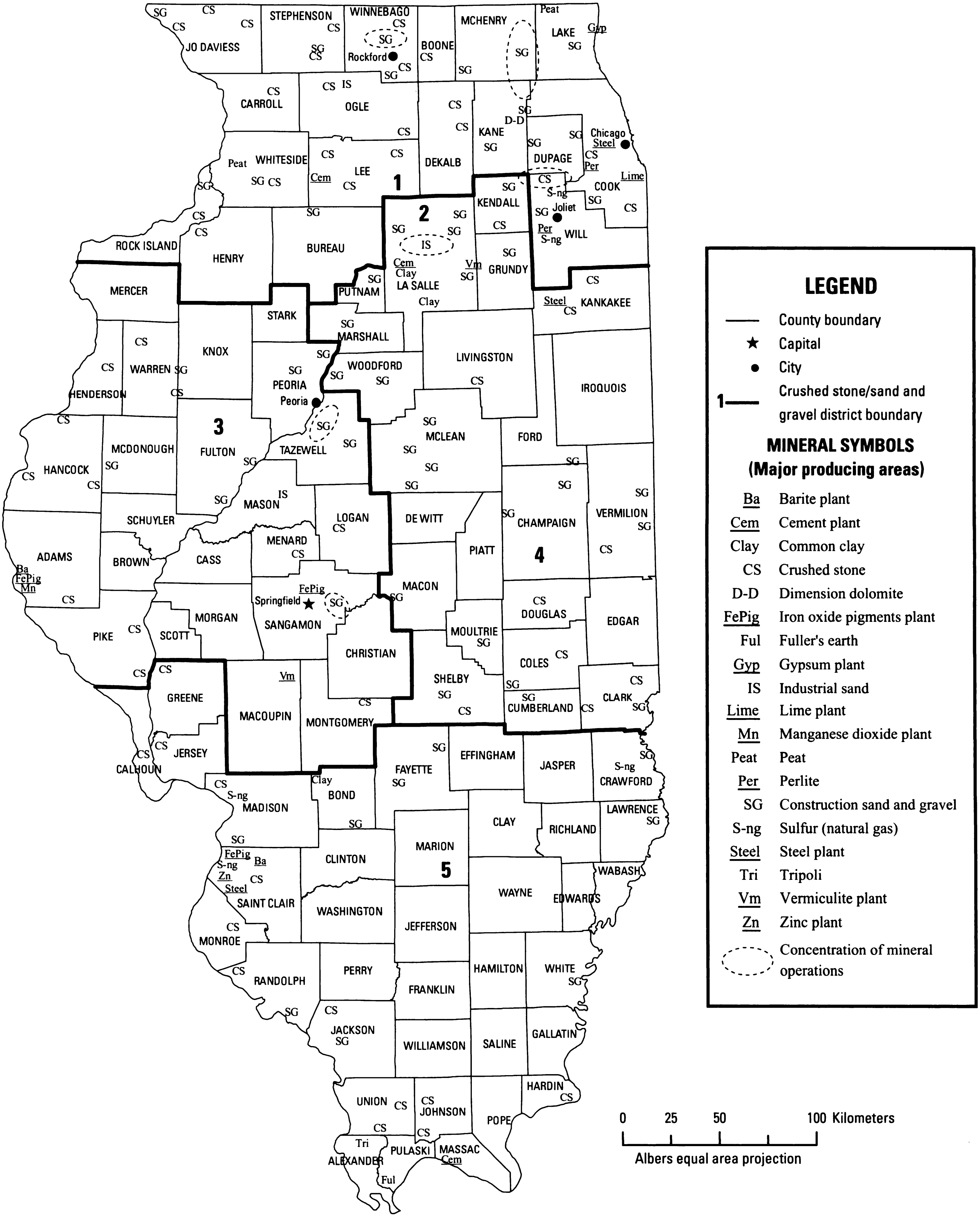
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sand.

[3] Includes railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

ILLINOIS



Source: Illinois State Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ILLINOIS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Illinois State Geological Survey for collecting information on all nonfuel minerals.

In 2006, Illinois' nonfuel raw mineral production[1] was valued at $1.22 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $10 million, or nearly 1% increase from the State's total nonfuel mineral value in 2005, which then had increased by $160 million, up more than 15% from that of 2004. The State was 20th in rank (16th in 2005) among the 50 States in the total nonfuel raw mineral production value and accounted for about 1.8% of the U.S. total.

Industrial minerals continued to account for all of Illinois' nonfuel mineral production in 2006; metals were last produced in 1996, when small quantities of copper, lead, silver, and zinc were produced from mines in the State. In 2006, crushed stone, by value, remained Illinois' leading nonfuel mineral commodity, accounting for 47% of the State's total nonfuel mineral value, followed, in descending order of value, by portland cement, with more than 25%; construction sand and gravel, more than 14%; industrial sand and gravel, nearly 8.4%; and fuller's earth clay, lime, and tripoli, with most of the remaining 5%. All other nonfuel minerals each accounted for less than one-half of 1% of the State's total value (table 1).

In 2006, increases in the values of crushed stone, up by $24 million, portland cement, up by $22 million, and lime, up by more than $8 million, more than offset decreases that took place in construction sand and gravel, down by $34 million, fuller's earth, down by about $12 million, and industrial sand and gravel, down by $2 million. Increases also took place in the values of tripoli and common clays (descending order of change) (table 1).

In 2006, Illinois continued to be first in the quantities of industrial sand and gravel produced and first among four States that produced tripoli, fourth in the production of peat, seventh in crushed stone, and ninth in portland cement. While the State decreased to seventh from sixth in fuller's earth clay, it continued to be a significant producer of construction sand and gravel and lime. Raw steel was produced in Illinois, but it was processed from ores and scrap metal obtained from other domestic and foreign sources. The State remained one of the Nation's leading raw steel-producing States with an estimated output of nearly 4 million metric tons (Mt), down about 3.6% from 4.14 Mt that were produced in 2005, as reported by the American Iron and Steel Institute (American Iron and Steel Institute, 2007, p. 74).

The following narrative information was provided by the Illinois State Geological Survey[2] (ISGS).

Overview

Illinois has the third-largest network of State and local roads and the third-largest Interstate highway system in the country. The State also has more than 26,000 bridges, 8,227 of which are in the State highway system (Illinois Department of Transportation, 2007, p. 17). A significant number of bridges need repair or replacement, as do many areas of the Interstate highway system, and many State and secondary highways and roads. Significant quantities of crushed stone and sand and gravel aggregate are required to keep Interstate highways in top condition, maintain major highways, and improve congested urban and rural highways. Construction aggregate constitutes approximately 80% of concrete pavement and more than 90% of asphalt. Thus, the State's aggregate resources are an important source of raw materials for construction and maintenance of the State's highway infrastructure. However, because of the depletion of reserves in existing quarries and pits, the encroachment of suburban developments atop existing resources, and the opposition to opening new mining and quarrying sites, the State is likely to face enormous challenges regarding how and where it can economically acquire the materials needed for building and rehabilitating its aging infrastructure.

Northeastern Illinois continued as one of the leading aggregate-producing and aggregate-consuming regions in the United States. Thick layers of Silurian and Ordovician dolomite are found in the area near Chicago, providing a primary source of crushed stone aggregate that accounted for most of the total stone production in the State in 2006. In the western and southern parts of the State, limestone of the Mississippian Period was extracted for construction aggregate, cement manufacture, and other related purposes. Limited amounts of Pennsylvanian Period limestone occur in the central part of the State and were quarried near the surface. In these areas, underground mining of the underlying Mississippian limestone may be necessary to meet the region's crushed stone needs because the near-surface Pennsylvanian limestone beds are limited in area or in depth, and generally are unsuitable for use in concrete for highway construction. Sand and gravel deposits are widely distributed throughout the State but are most abundant and of highest quality in northeastern Illinois. They are primarily extracted from glacial deposits in the central and northeastern parts of the State. Production of sand and gravel, however, has not increased significantly since the late 1960s, likely because of the better quality and larger reserves of crushed stone aggregate, and the difficulty in securing permission for new sand and gravel operations owing to public opposition.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Zak Lasemi, Geologist and Head, Industrial Minerals and Resource Economics Section, and Donald G. Mikulic, Geologist, coauthored the text of State mineral industry information provided by the Illinois State Geological Survey.

Commodity Review

The year 2006 was highlighted by the continuation of two major trends in the industrial minerals mining and quarrying industries. First, there were several noteworthy acquisitions of major aggregate producers, primarily in the Chicago area. Hanson plc, London, United Kingdom, completed the purchase of Material Service Corp. in June. Material Service was the 19th ranked producer of construction aggregates in the United States and owned 11 stone quarries and 3 sand and gravel pits in Illinois and Indiana, including the Thornton Quarry near Chicago, which is one of the largest quarries in the United States. Material Service sold about 18 million metric tons (Mt) of aggregates in 2005 and was estimated to have nearly 1.4 billion metric tons of aggregate reserves. Lafarge North America Inc., Herndon, VA, completed the acquisition of several operations around the Chicago area, and in north-central Illinois. These companies included Aux Sable Stone Company, Conco-Western Stone Company, Fox River Stone Company, Joliet Sand and Gravel, Utica Stone Company, and Western Sand & Gravel Company, all of which had been locally owned. The combined operations provided Lafarge with three underground aggregate mines, three quarries, two sand and gravel operations, an Illinois River dock, and decorative and landscape stone sales yards. Lafarge's North American operations are the leading diversified suppliers of construction materials for residential, commercial, institutional, and public works construction projects in the United States and Canada. Lafarge (a wholly owned subsidiary of Lafarge S.A., Paris, France) is a leading global supplier of aggregates, cement, concrete, and gypsum. In other related actions, Aggregate Industries Inc., Derwood, MD., completed an agreement with U.S. Equity Partners, L.P. and Park Avenue Equity Partners, L.P. to purchase Meyer Material Company in northeastern Illinois at a cost of $231 million. Meyer operated 6 sand and gravel pits, as well as 25 ready-mix concrete plants, and a concrete paving products manufacturing facility. Meyer has 113 Mt of reserves at its sand and gravel pits, and additional underground resources which may be considered for future development.

The second trend was the continued progression of major changes in the Illinois aggregate industry that were likely to have a long-term impact on sources and production of aggregate resources. Most noteworthy were the changes taking place in the source of aggregates for the Chicago metropolitan area and the surrounding region of northeastern Illinois. Historically, these resources have been derived from surface quarries developed in the Silurian Period dolomites which underlie the area. During the mid- and late-19th century, considerable amounts of lime and building stone were produced from these rocks. While most of these resources were used within the region, the building stone was also exported throughout the Midwest. At the beginning of the 20th century, crushed stone became the primary product from these quarries and remains so today. Depletion of existing reserves and the increasing difficulty in obtaining permission to develop new surface quarries has encouraged producers to begin mining the more deeply buried Ordovician Period dolomite that underlies the entire region. The Elmhurst-Chicago Stone Company in the Chicago suburb of Elmhurst opened the first of these mines in the 1970s. Although this specific mine has since been closed, an increasing number of other mines have been opened, while others are under development. There also has been considerable interest in exploration for additional underground mine sites. Existing underground mines were opened in depleted quarries or sand and gravel pits. However, one mine was currently under development on property that neither had been owned previously by an aggregate producer nor had been the site of any mineral resource extraction. The primary target for these new underground mines has been the Ordovician dolomite but in some areas around Chicago considerable amounts of Silurian dolomite potentially could be extracted from underground mines. In summary, the long term trend for this area was likely to be the replacement of Silurian dolomite with Ordovician dolomite as the primary source of locally produced aggregates in the Chicago region, and these new sources would be extracted using underground mining methods. Many small- to medium-sized surface quarries of Silurian dolomite were likely to be depleted of reserves in a relatively short time, although a few of the largest quarry operations could have sufficient reserves to last for a few more decades.

Stringent pollution control regulations set by State and Federal governments have accelerated installation of limestone-based flue-gas desulfurization (FGD) systems to reduce sulfur oxide (SO_2) emissions and other pollutants at coal-fired powerplants. Consequently, the demand for high-calcium limestone scrubbing agent used in the FGD systems continued to increase. The U.S. Clean Air Interstate Rule, to be implemented in 2010, requires significant SO_2 emission caps for all coal-fired powerplants (Dickerman and Sewell, 2007). This rule will affect large coal-fired powerplants burning high-sulfur coal as well as smaller plants that burn low- to medium-sulfur coal. Most of the plants affected are in the States east of the Mississippi River.

Results of recent investigations showed that limestone-based FGD systems also are capable of removing flue-gas mercury at coal-fired powerplants. As a result, the use of limestone-based FGD systems and its associated demand for good quality, high-calcium limestone resources takes on added significance. The Clean Air Mercury Rule issued by the U.S. Environmental Protection Agency requires that coal-fired powerplants reduce mercury emissions 47% by 2010 and 79% by 2018. A more stringent rule proposed by the State of Illinois requires a 90% reduction in mercury emissions from powerplants in the State by mid-2009.

Because of the importance of high-calcium limestone as a scrubbing agent, it is essential that issues associated with the transport, availability and suitability of high-calcium limestone resources for use in FGD powerplants be addressed. Nearby sources of suitable limestone raw material must be found to feed existing and new scrubber installations, and to aid in the selection of proper resources for desulfurization systems in the future.

Illinois has abundant limestone and dolomite resources. However, high-calcium limestone is not readily available throughout the State. The suitability of limestone for FGD applications varies and the most suitable limestone resources are not widely available. Through grants from the Illinois Clean Coal Institute, the ISGS recently conducted a statewide inventory and characterization of limestone and dolomite resources. The results indicated that limestone containing more than 95% calcium carbonate ($CaCO_3$) commonly occurs in the western and southern parts of Illinois along the Mississippi and Ohio Rivers. These materials currently are extracted from the Mississippian Period deposits in existing quarries close to the rivers, but a potential for mining high-calcium limestone also exists in rocks of the Ordovician, Silurian, and Devonian Periods exposed in the southern part of the State. Limited amounts of Pennsylvanian Period high-calcium limestone deposits are present in the central part of the State, and these rocks are mined at a few locations. The limestone is variable in purity but in some cases may contain between 90% and 95% $CaCO_3$. Dolomite predominates in northern Illinois, especially in the Chicago area, and this material is ill-suited for use in FGD scrubbers.

Interest in fluorspar mining was renewed in the Illinois-Kentucky Fluorspar Districts in 2006, as a result of diminishing supplies in the National Defense Stockpile (NDS) and uncertain availability of supplies from import sources. Fluorspar had not been mined in Illinois since 1995, except for a small quantity recovered by Hastie Mining and Trucking Co. as a byproduct of limestone quarrying that was stockpiled for future processing. Since the mid-1990s, Hastie has supplied fluorspar to several domestic markets using fluorspar purchased from the NDS. Hastie owns the mineral rights to several former fluorspar properties in Illinois and planned to produce about 20,000 metric tons per year (t/yr) of acid-grade fluorspar and 30,000 t/yr of metallurgical grade fluorspar from its mine and quarry operations (Miller, 2008).

A proposal by Prairie Material Sales Inc., Bridgeview, to develop a new 49-hectare (ha) dolomite quarry site in Kendall County, northeastern Illinois was rejected by the 10-member Kendall County Board voting in special session. The county board's decision followed similar verdicts from the Kendall County Zoning Board of Appeals and the Kendall County Regional Planning Commission.

Legislation and Government Programs

On the national level, Illinois fared well under a new, multiyear Federal highway bill, SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) passed in 2005. Illinois received the 10th largest percentage increase and the 5th largest net increase in guaranteed Federal highway funding. Illinois also receive approximately $662 million in additional Federal highway funding beyond these guaranteed levels for key State highway and bridge projects. In order to continue with maintenance and development of highways and bridges, the Illinois Department of Transportation (IDOT) expected a combined total of State and Federal funding in the range of $12.1 to $20.3 billion would be needed during fiscal years 2004 to 2009. According to the Illinois Association of Aggregate Producers (IAAP), IDOT proposed spending $10.43 billion in State funds for the fiscal years 2007 to 2012 to maintain the current State highway system. However, the continued State budget crisis and impasse on authorizing any major capital funding for transportation and other needs in recent years has significantly affected the implementation of this program. There was concern that the State could lose a significant amount of matching funding from the Federal highway program if the budget impasse continued.

At the State level, the IAAP briefed the Illinois General Assembly leadership and key appropriations and transportation committee members about infrastructure issues. The importance of adequate transportation infrastructure funding and the actions necessary to restore the vitality of Illinois' road program were highlighted in a Transportation for Illinois Coalition publication entitled "Rough Roads Ahead." Additionally, legislation was passed to eliminate some road fund diversion, thus returning $21 million to the road fund. Some other State bills that could have adversely affected the aggregate industry also were eliminated. IAAP Environmental Committee members worked with the Illinois Environmental Protection Agency (IEPA) to develop new lifetime general operating permits for both small and large aggregate processing plants. Committee members also worked with the IEPA on National Pollutant Discharge Elimination System (NPDES) permit changes, and proposed regulations for operations that accept clean construction or demolition debris. Aggregate producers obtain NPDES permits from the IEPA to ensure that water discharged from pits and quarries does not harm the environment. Section 12.5 of the Illinois Environmental Protection Act requires aggregate producers to pay the State of Illinois a $5,000 annual fee for every NPDES discharge permit in force. Legislation was sponsored to reduce the annual NPDES fees while ensuring that the State continued to receive the annual revenues necessary to implement the IEPA clean water regulatory program for aggregate mines. IAAP legislative committee members developed and expanded communication links with State legislators to promote uniform, proactive communication about aggregate issues. Members of the Specifications/Technical Committee negotiated with IDOT regarding the increased use of Reclaimed Asphalt Pavement (RAP) in Hot Mix Asphalt as well as the use of RAP as aggregate. The IAAP also formed part of a working group developing proposed changes to IDOT's Alkali-Silica Reactivity policy. The AgLime Sub-Committee manned a booth during the University of Illinois' Agronomy Day where members provided information promoting this product. Finally, the IAAP worked with the National Stone, Sand and Gravel Association on a Regional Technology Seminar relating to aggregate research topics of interest to IDOT (Illinois Association of Aggregate Producers, 2007).

Reclamation and Natural Resources Programs

The City of Chicago began development of a new park at the site of the historic Stearns Quarry in the Bridgeport area of the city. The site had been used as a landfill since 1970. After filling most of the 115-meter-deep pit, the city preserved a portion of the upper quarry as part of a unique new city park which would highlight the geology and industrial history of the quarry. Operations were begun at the quarry about 1833 when stone from the site was used in the construction of the first piers at the mouth of the Chicago River. By the 1850s, the privately owned quarry had become a major lime production center in Chicago. The quarry was sold in the 1930s and subsequently operated by Material Service Corporation until 1970 when it was sold to the city of Chicago.

Unimin Corporation partnered with Bat Conservation International, the Illinois Department of Natural Resources, Southern Illinois University, the U.S. Fish & Wildlife Service, and the U.S. Forest Service to survey the abandoned underground Magazine silica mine and carefully document the bat population at the site. Native Illinois bat species including the big brown bat, little brown bat, Indiana bat, northern long-eared bat, and the eastern pipstrelle were documented in and around the mine.

This effort by Unimin and its employees, which was directed toward protecting resources critical to bat reproduction and hibernation, strengthened and promoted a conservation ethic that benefited not only bats, but the surrounding fragile Shawnee National Forest ecosystem as a whole. To further enhance the value of the property for local wildlife species, the wildlife team at Unimin implemented a project to convert about 4 hectares (ha) of fescue grassland into a native wildflower and grass meadow. Two test sites, prepared and seeded earlier, were expanded and reseeded and now bloom with colorful stands of wildflowers and sunflowers. The plant types will increase the diversity and numbers of pollinators, such as bees, butterflies, and songbirds,. Other projects included the planting of native hardwood trees, the eradication of kudzu, and the management of the wild turkey population. The wildlife team also worked on wildlife rehabilitation by reintroducing animals at suitable locations on Unimin property in concert with FREE AGAIN, Inc.

Public Outreach

Members of the IAAP Public Information and Education Committee participated in a number of outreach activities, including: Earth Stewardship Day; the National Science Teachers Association Midwest Conference; the Ninth Annual Science Teachers Workshop, and several mine tours. The annual Science Teachers Workshop allows teachers to refresh their knowledge of science and learn about the importance of various minerals and aggregates. Thirty-two elementary and high school teachers attended lectures and participated in hands-on activities presented by academic professionals, government, and industry. Each activity explored Illinois geology, fossils, aggregate mining, or minerals in our everyday lives (Illinois Association of Aggregate Producers, 2007).

In September, McHenry County Board members, city and township officials, and a State Senator were provided with an educational tour of three sites, including a sand and gravel plant, an asphalt plant, and a clean construction and demolition debris fill site. The tour was organized by the McHenry County Gravel Advisory Council, formed in 2003 to provide a forum for the County, townships, and municipalities to discuss mine-related issues impacting their communities. The Council consists of the chief elected official of each unit of local government and the chief corporate official of each company producing aggregates within McHenry County. Discussions during the tour noted the importance of continuous land reclamation as a requirement for receiving mining permits. Several locations were cited where land reclamation had transformed previous mining operations into commercial and residential areas.

Vulcan Material Company held its biannual open house at McCook Quarry in September, hosting 6,000 guests who toured the 100-year-old quarry. The event offered several science, geology, and engineering related educational activities for families, led by company geologists and specialists. A Children's Workshop provided an opportunity for the young children to learn about rocks and geology.

Award

Employees at Unimin Corporation's Tamms/Elco Plant in southern Illinois distinguished themselves by winning the Wildlife Habitat Council's 2005 Corporate Habitat of the Year Award, which is presented to one recertified program each year. Employees and volunteers took advantage of the opportunities created by the site's mining and reclamation program to incorporate wildlife management projects for a variety of native species covering nearly 800 ha. Because most of the Tamms/Elco land holdings serve as suitable bluebird habitat, the wildlife team maintained a bluebird nest box monitoring project. Approximately 67 nest boxes were erected on the site, several of which were constructed by the employees. Employees monitored and maintained the boxes, and removed wasp nests or other possible invaders from the boxes. The program has succeeded in significantly increasing the population of bluebirds in the area, with more than 60% of the nest boxes being occupied.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ILLINOIS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	3,010	233,000 e	3,240	286,000 e	3,110	308,000 e
Clays:						
Common	247	1,390	119	667	116	700
Fuller's earth	218	W	225	W	112	W
Gemstones, natural	NA	70	NA	14	NA	34
Sand and gravel:						
Construction	38,700	203,000	37,400	210,000	32,500	176,000
Industrial	4,950	86,200	5,510	104,000	5,410	102,000
Stone, crushed	75,300	462,000	76,400 r	549,000 r	75,400	573,000
Combined values of lime, peat, stone [dimension dolomite (2005)], tripoli and values indicated by the symbol W	XX	65,000	XX	64,500	XX	62,700
Total	XX	1,050,000	XX	1,210,000	XX	1,220,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
ILLINOIS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	111 r	56,800 r	$404,000 r	108	54,000	$395,000
Dolomite	14	19,500	144,000	11	20,300	168,000
Sandstone	2	125	1,200	3	1,160	9,960
Total	XX	76,400 r	549,000 r	XX	75,400	573,000

rRevised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	30	322
Riprap and jetty stone	280	2,720
Filter stone	74	402
Other coarse aggregate	1,870	15,700
Total	2,250	19,100
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,610	18,100
Bituminous aggregate, coarse	486	4,680
Bituminous surface-treatment aggregate	575	4,270
Railroad ballast	258	1,740
Other graded coarse aggregate	10,200	85,900
Total	14,100	115,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	145	755
Stone sand, bituminous mix or seal	186	1,150
Screening, undesignated	180	844
Other fine aggregate	2,000	10,900
Total	2,510	13,700
Coarse and fine aggregates:		
Graded road base or subbase	4,280	29,600
Unpaved road surfacing	1,220	7,610
Crusher run or fill or waste	267	1,750
Other coarse and fine aggregates	10,200	63,100
Total	15,900	102,000
Other construction materials	287	1,750
Agricultural:		
Limestone	W	W
Poultry grit and mineral food	W	W
Other agricultural uses	W	W
Chemical and metallurgical:		
Cement manufacture	2,520	23,500
Chemical stone	W	W
Special:		
Mine dusting or acid water treatment	W	W
Asphalt fillers or extenders	W	W
Other miscellaneous uses and specified uses not listed	6	164
Unspecified:[2]		
Reported	20,000	174,000
Estimated	16,000	110,000
Total	35,600	287,000
Grand total	75,400	573,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2[2]		District 3		District 4		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	1,230	11,000	284	2,760	740	5,340	--	--
Coarse aggregate, graded[4]	7,650	66,000	2,660	21,200	3,600	26,000	226	1,540
Fine aggregate (-⅜ inch)[5]	1,680	9,110	465	2,180	365	2,390	--	--
Coarse and fine aggregates[6]	9,210	57,000	2,020	12,100	4,720	32,900	--	--
Other construction materials	287	1,750	--	--	--	--	--	--
Agricultural[7]	W	W	W	W	W	W	--	--
Chemical and metallurgical[8]	W	W	W	W	W	W	--	--
Special[9]	--	--	W	W	--	--	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--	6	164	--	--
Unspecified:[10]								
Reported	15,500	135,000	2,190	19,100	2,300	20,400	--	--
Estimated	11,000	76,000	3,200	23,000	1,900	13,000	--	--
Total	47,600	362,000	12,900	103,000	14,700	108,000	226	1,540

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8] Includes cement manufacture and chemical stone.

[9] Includes asphalt fillers or extenders and mine dusting or acid water treatment.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5

ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,600	$55,300	$5.20
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	1,170	4,840	4.15
Asphaltic concrete aggregates and other bituminous mixtures	1,330	7,110	5.34
Road base and coverings[3]	2,740	19,500	7.14
Fill	1,990	8,880	4.46
Snow and ice control	52	340	6.52
Other miscellaneous uses[4]	79	474	6.03
Unspecified:[5]			
Reported	2,850	15,700	5.51
Estimated	11,600	63,700	5.48
Total or average	32,500	176,000	5.42

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes filtration and roofing granules.

[5] Reported and estimated production without a breakdown by end use.

TABLE 6

ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	5,970	30,400	849	4,060	3,560	19,000
Asphaltic concrete aggregates and road base materials[3]	1,840	12,800	551	3,210	1,330	8,560
Fill	1,270	6,350	311	955	219	888
Other miscellaneous uses[4]	27	199	73	352	31	260
Unspecified:[5]						
Reported	1,940	10,800	90	376	813	4,470
Estimated	6,480	35,700	2,000	11,000	2,930	15,700
Total	17,500	96,200	3,870	20,000	8,890	48,900

	District 4	
Use	Quantity	Value
Concrete aggregate and concrete products[2]	1,420	6,700
Asphaltic concrete aggregates and road base materials[3]	348	2,120
Fill	194	686
Other miscellaneous uses[4]	(6)	2
Unspecified:[5]		
Reported	2	31
Estimated	225	1,240
Total	2,180	10,800

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

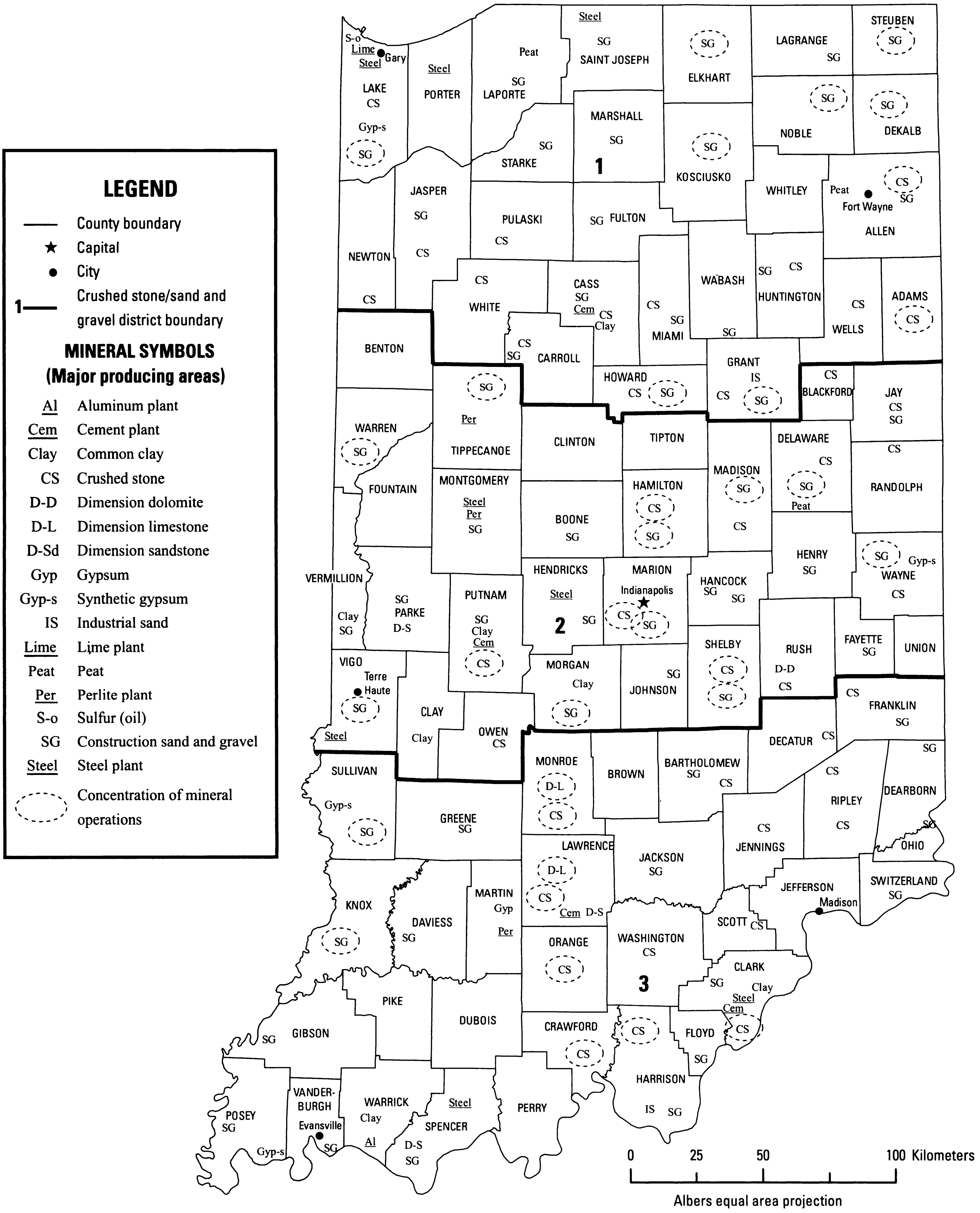
[3] Includes road and other stabilization (cement and lime).

[4] Includes snow and ice control, filtration, and roofing granules.

[5] Reported and estimated production without a breakdown by end use.

[6] Less than ½ unit.

INDIANA



LEGEND

—	County boundary
★	Capital
●	City
1 —	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-D	Dimension dolomite
D-L	Dimension limestone
D-Sd	Dimension sandstone
Gyp	Gypsum
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
◌	Concentration of mineral operations

Source: Indiana Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF INDIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Indiana Geological Survey for collecting information on all nonfuel minerals.

In 2006, Indiana's nonfuel raw mineral production was valued[1] at $982 million, on the basis of annual U.S. Geological Survey (USGS) data. This was a 10% increase of $89 million from the State's total nonfuel mineral value for 2005, which had increased by $109 million, or more than 14%, from 2004 to 2005 (table 1). The State was 23d in rank (22d in 2005) among the 50 States in total nonfuel raw mineral production value, of which Indiana accounted for nearly 1.5% of the U.S. total.

In 2006, crushed stone, by value, remained the State's leading nonfuel mineral commodity, followed by cement (portland and masonry), construction sand and gravel, lime, and dimension stone. The combined values of these five mineral commodities accounted for more than 95% of the State's total nonfuel mineral production value. Although only small increases took place in the quantities of crushed stone and construction sand and gravel that were produced and portland cement production was down slightly, increases in these mineral commodity values and in the value of lime led the State's increase in total nonfuel mineral value. The value of crushed stone rose by $28 million, portland cement value was up by $24 million, and the value of construction sand and gravel increased by $18 million. A significant increase in the production of lime resulted in a nearly $15 million rise in its value. Also up in value were (in descending order of change) masonry cement, common clays, and industrial sand and gravel. The largest decrease in value took place in dimension stone; a small decrease in production resulted in a more than $7 million decrease in the commodity's value (table 1).

In 2006, Indiana rose in rank to second from third in the quantity of dimension stone produced as compared with other producing States; the State also increased to seventh from eighth in crude gypsum production, and to eighth from ninth in the production of lime. Indiana ranked 5th in masonry cement production, and it continued to be 5th in the quantity of ball clay produced and 10th in the production of portland cement. The State's aggregate mining companies produced substantial quantities of crushed stone and construction sand and gravel, remaining 12th and 15th in rank, respectively; additionally, substantial quantities of common clays were produced in the State.

The State's mines produced exclusively industrial minerals and coal; all raw steel and primary aluminum produced in the State were processed from materials received from other domestic and foreign sources. Indiana continued to lead the Nation in the production of raw steel, with an estimated output of about 23.8 million metric tons (Mt) of raw steel, up about 6.3% from 22.4 Mt that was produced in 2005, as reported by the American Iron and Steel Institute (American Iron and Steel Institute, 2007, p. 74). Based upon USGS annual data, the State continued as the second-leading primary aluminum-producing State.

The following narrative information was provided by the Indiana Geological Survey[2] (IGS).

Employment

According to the United States Department of Labor, Mine Safety and Health Administration (MSHA), an average of 3,533 individuals were employed in Indiana's industrial minerals sector during 2006, representing a 2.6% decrease from 2005 employment levels.

Commodity Review

Industrial Minerals

Cement.—Buzzi Unicem USA, Inc. received a Portland Cement Association Safety Innovation Award for an innovation installed at its Greencastle plant in Putnam County that protects employees against fall-related mishaps. The innovative system consists of portable safety panels that easily but securely attach to existing hand rails.

Clays.—Indiana's clay industry began to experience some revitalization during the year. In response to increasing demand, General Shale Products Corp. planned to expand brick production at its Mooresville plant in Morgan County through installation of a $30 million, completely automated, robotic production line. Production was anticipated to nearly double to 200 million bricks per year, 90 million more than are currently produced. Also, Boral Bricks, Inc. was preparing to open a new brick plant in the Terre Haute area in Vigo County, and Brampton Brick, Ltd., Brampton, Ontario, Canada, was expected to open a plant near Farmersburg in Sullivan County. In another action, BrickCraft, LLC began mining its own shale from a pit behind the company's brick plant in Clay County that had opened in 2004. As a result of the preceding developments, clay production was likely to increase significantly within the State. To further meet the increasing demand for the clay raw material used at these plants, some clay may also be recovered as a byproduct material from coal mining operations.

Sand and Gravel, Construction.—MSHA identification numbers were provided to three sand and gravel companies enabling them to begin production by yearend. These new mining operations included Littleton & Sons Sand & Supply's Mann Road pit, Morgan County; Eagle Materials, LLC's, Smith Valley pit, Johnson County; and Clifton Sand & Gravel, LLC's operation, Union County. U.S. Aggregates, Inc. planned to open a second sand and gravel pit in the Waverly area, Morgan County, but faced opposition from area landowners.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Kathryn R. Shaffer, Minerals Statistician, authored the text of State mineral industry information provided by the Indiana Geological Survey.

During the year, six operations underwent a change in ownership. The acquisitions included Cook Block & Brick, Inc., Madison County to Elda Corp; J.R. Sand & Stone, Steuben County to Shimp Sand & Gravel, LLC; Northwest Indiana Aggregates, Jasper County to Morocco Sand & Gravel, Inc.; Smith Mining's Bethlehem Sand & Gravel, Clark County to Johnson Construction Materials, LLC; Spray Sand and Gravel, Inc., Jackson County to Spray, Inc.; and Wilson Excavating's Lyon Pit, Steuben County to Fremont Sand & Gravel, LLC. The Bethlehem Sand & Gravel operation had been involved in Chapter 11 bankruptcy proceedings, and Cook Block & Brick, Inc. operated only briefly after opening in 2004. Elda Corp. planned to operate the facility as Cook Gravel.

Nine sand and gravel operations were listed by MSHA as having been closed during 2006. Among the closed operations were Aggregate Industries' Goshen pit, Elkhart County, U.S. Aggregates' Planfield Plant Southwest, Hendricks County, and Vulcan Materials Company's Hanna Sand and Gravel, La Porte County.

Elkhart County Gravel Corp.'s New Paris operation in Elkhart, Clark County received a Sentinels of Safety Award from The National Mining Association and MSHA. The award was presented in the small bank or pit category, as part of the Sterling Safety and Excellence Awards Program. Irving Gravel Company, Inc.'s, Kendallville Plant, Noble County also received an award from the Indiana Mineral Aggregates Association for the plant's 16-year safety record.

Stone, Crushed.—In 2006, a new mine was opened, and several others either changed ownership, closed, or expanded. Ingram Enterprises, LLC's, Ingram Quarry in Monroe County received an MSHA identification number and began operations during the year. Five other active quarries changed ownership. Vulcan Materials Company acquired Mathes Quarry, LLC, in Harrison County; Watson Gravel, Inc. acquired Parker Stone, LLC, in Putnam County; and Hanson PLC acquired Material Service Corp., which included three quarries in Indiana and additional mines in Illinois. The Indiana quarries affected were Babcock Quarry in Jasper County, Monon Quarry in White County, and Ward Stone Quarry in Pulaski County. Five quarry operations also were closed during the year. Junction Limestone, Inc.'s Uland Quarry in Greene County closed at the beginning of the year. Rogers Group, Inc. ceased removing and processing overburden from the Indiana Limestone Company's Crown dimension limestone quarry in Monroe County. However, the dimension stone mine remained open. Martin Marietta Aggregates' Gosport Quarry in Owen County also was listed as abandoned. Hanson Aggregates Midwest, Inc. closed its Tom Miller underground mine in Scott County and its Atkins underground mine in Clark County. Hanson had acquired both quarries in 2005 from Liter's of Indiana, Inc. The Cooper's Lane Quarry, also in Clark County, and acquired in that transaction, remained active along with surface operations at the Atkins Quarry. Engineering Aggregates Corp. planned a 45.3-hectares (ha) expansion east of its present location in Cass County. As part of the expansion project, the processing plant and stockpiles were to be relocated.

Crushed stone producers were recipients of several awards during the year. A Bronze Award was presented to Hanson Aggregates Midwest, Inc.'s, Aggrock Quarry in Clark County by the National Stone, Sand and Gravel Association under its Environmental Excellence Awards program. Several other Hanson Aggregates quarries in the State received certificates of achievement as part of that program. A Sentinels of Safety Award was presented to Rogers Group, Inc.'s, Sieboldt Quarry in Lawrence County by the National Mining Association and MSHA as part of their Sterling Safety and Excellence Awards Program. The quarry also received an award for its 18-year safety record from the Indiana Mineral Aggregates Association.

Stone, Dimension.—The Indiana Limestone Institute reported strong demand for its product throughout the year, primarily in collegiate construction projects and high-end residential development. The latter demand remained particularly strong in the eastern United States. Indiana dimension limestone is often used as exterior veneer, columns, balustrades, and for other purposes on these residential structures. Gaining increasing interest in the industry was the "thin wall" dimension stone market. In this end use, small pieces of stone, generally ranging from 2.5 to 4.5-centimeters thick are mortared into relatively short walls, usually one story or so, to give the look of full, thick walls without the expense and weight. Indiana quarries primarily sell the blocks and slabs to out-of-State companies that make the thin wall products. Increased production of the tools and equipment required to manufacture the thin wall products also has been observed (Jim Owens, Indiana Limestone Institute, oral commun. July 11, 2007). B.G. Hoadley Quarries, Inc., near Bloomington, Monroe County, increased production by 30%, and reduced manpower requirements by 30% through use of a newly installed automated hydraulic drill rig and hydraulic wedges. Canada accounts for about 90% of the company's sales. Indiana Limestone Company, Bedford, Indiana, completed a billion-dollar condominium project at 15 Central Park West, New York, NY. This 80,450-square-meter, neoclassically designed structure was clad in 26,940 square meters of the company's Empire Full Color Blend limestone. The Divinity School addition at Duke University in Durham, NC, received a 2006 Pinnacle Award of Merit in the Commercial Exterior category from the Marble Institute of America (MIA). The building was trimmed in Indiana buff limestone that was mined from Independent Limestone Company, LLC's quarry near Bloomington, Monroe County, and milled by Bybee Stone Company, Inc. in Ellettsville, Monroe County. Bybee Stone Company also completed work on the Schermerhorn Symphony Center, Nashville, TN, using similar stone provided by Independent Limestone Company. This project also has been nominated for an MIA Pinnacle Award.

Metals

Aluminum.—Alcoa Corp.'s Warrick County plant planned to purchase a $7.3 million rotary furnace in 2007 that would permit greater reuse of the waste material generated in the smelting process. Equipment also was to be installed that would allow for production of the only lithographic-quality sheet aluminum in North America. Work also continued on the installation of wet limestone scrubbers at all four units of the plant's power station, in order to improve environmental performance and increase power efficiency. The scrubber project was expected to be completed in 2008. A new coal mine that supplies about 45% of the fuel for the Warrick smelter was opened in Mt. Carmel, IL, during the year. In recognition for the operational improvements made at the Warrick plant, which effectively saved 59,400 megawatts per year of electricity, the plant received the Governor's Award for Environmental Excellence.

Steel.—Mittal Steel N.V., Rotterdam, Netherlands, merged with Arcelor S.A.(headquartered in Luxembourg). The merged company, ArcelorMittal, consists of 61 mills in several countries with crude steel production totaling 116 million metric tons per year. Mittal Steel has holdings in Indiana at Burns Harbor in Porter County and at Indiana Harbor in Lake County along Lake Michigan in northern Indiana. The Indiana Harbor mill lost about 181,000 metric tons of steel production early in the year as a result of a molten-iron spill that required a month-long shutdown for cleanup and repairs. In other activities, Mittal began work on the expansion of its East Chicago, IN, research and development center in July.

U.S. Steel Corp. completed the rebuilding of a blast furnace in January at its Gary Works in Lake County, subsequently restarting the furnace. Production capacity of the rebuilt furnace was increased by 30% to about 8,350-metric tons per day of molten iron. Some blast furnaces at the Gary Works were idled during the fourth quarter owing to weaker demand and the need for maintenance. U.S. Steel's Midwest Plant in Portage received a tax reduction from the city of Portage for a plant upgrade that will permit production of high-strength steel suitable for the auto industry. The Portage plant operates as a finishing facility that is part of the Gary Works.

Improvements made at Steel Dynamics, Inc.'s, Flat Roll Division in Butler, DeKalb County were expected to increase annual production by 15% to 2.7 Mt in 2007. However, production at the mill declined during the fourth quarter of 2006 as a result of a weakened market for flat-rolled steel. The company also planned to double the size of its Jeffersonville galvanized steel plant, spending about $39 million on the project. The finances were to be directed toward improvements that would allow for production of prepainted, acrylic-coated, and aluminum-zinc-alloy-coated steel. Construction of Steel Dynamic's SBQ Bar Products Division plant in Pittsboro, Hendricks County, was completed as scheduled, and was renamed the Engineered Bar Products Division. Steel Dynamics also planned to construct a new steel-beam mill at its Columbia City site in Whitley County, with construction expected to be completed by mid-2007. A portion of the steel beam production from the existing mill was to be moved to the new mill, allowing for the existing mill to produce rails for railroad use. A rail-welding facility also was to be constructed at the Columbia City site. In further actions, Steel Dynamics formed a joint venture, Dynamic Composites, LLC, with Primix Corp. to produce composite railroad ties in a separate facility at the Columbia City site. The composite tie consists of a steel core filled with concrete that is encapsulated with a synthetic material composed of recycled rubber and plastic.

Environmental Issues

The Indiana Department of Environmental Management (IDEM) created an improved online search engine for determining the status of air quality permit applications. It is available for use at http://www.in.gov/ai/appfiles/idem-caats/. The agency also launched the Environmental Stewardship Program (ESP), a State version of the U.S. Environmental Protection Agency's National Environmental Performance Track program. In return for exceeding current State minimum standards for environmental management, a company may be entitled to reduced record keeping and reporting requirements, less monitoring, fewer inspections, more flexible permits, and more expeditious processing of permit applications. Additional information concerning the ESP can be found at http://www.in.gov/idem/prevention/esp/index.html. A company may participate in the Federal and State programs.

U.S. Steel Corp. arrived at an agreement with the IDEM pertaining to Clean Air Act violations at its Gary Works coke battery facility. As part of the agreement, U.S. Steel was required to pay a fine and perform several projects to improve the environment at the facility.

Government Programs

Indiana's aggregates and cement industries are likely to benefit appreciably from additional road construction in the near future as a result of legislation passed that amends current State law to permit some public-private agreements to manage bridges, roads, and toll roads. Subsequent to the passage of this legislation, the Indiana Toll Road was to be leased for $3.8 billion, paid in advance, covering a period of 75 years. Interest derived from the prepaid funds was then to be directed toward completion of highway construction projects within the State, including $700 million for planned extension of an Interstate. The legislation also provided an additional $75 million to local governments for each of the next 2 years to assist in alleviating the backlog of planned road construction projects. Funding for new road construction throughout the State was expected to reach $874 million in fiscal year 2015, an amount four times that of the fiscal year ending in June 2006.

Martin Marietta Aggregates's request to rezone about 39 ha (96 acres) in order to expand its mining operation was denied in April. Earlier passage of a mining ordinance by the city of Carmel, Hamilton County, and continued objections from its residential neighbors remained as obstacles to the company's expansion plans. However, in July, Martin Marietta won a preliminary injunction preventing the ordinance from taking effect, but the case was still in litigation at yearend. Martin Marietta produces sand and gravel on the surface and crushed limestone nearby in an underground mine, both within the Carmel city limits.

Detailed aerial photos of the entire State were taken during the year and can be viewed at http://www.indianamap.org.

These images also are available for viewing on Google Maps at http://www.maps.google.com and the IGS Web site at http://igs.indiana.edu. The IGS also released numerous publications of interest to the industrial minerals industry. These publications included a Directory of Industrial Mineral Producers in Indiana (Shaffer, 2006); A Study of the Remediation of Pad Marks on Indiana Limestone (Ennis, 2006, 31 p.); Karst (Hasenmueller and Powell, 2006, 1 p.); and Generalized Stratigraphic Column of Indiana Bedrock (Thompson and Sowder, 2006, 1 p.).

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Ennis, M.V., 2006, A study of the remediation of pad marks on Indiana limestone: Indiana Geological Survey Report of Progress 34, 31 p.

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Shaffer, K.R., 2006, Directory of industrial mineral producers in Indiana: Indiana Geological Survey Directory 11, 74 p. (Also available as a CD-ROM.)

Thompson, T.A., and Sowder, K.H., 2006, Generalized stratigraphic column of Indiana bedrock: Indiana Geological Survey Poster 6.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN INDIANA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	3,080	218,000 [e]	3,060	243,000 [e]	3,030	267,000 [e]
Clays, common	729	8,910 [r]	809	13,500	779	16,400
Gemstones, natural	NA	4	NA	4	NA	4
Sand and gravel, construction	28,300	116,000	28,400	135,000	29,300	153,000
Stone:						
Crushed	56,800	265,000	58,900 [r]	321,000 [r]	58,900	349,000
Dimension	251	45,500	240	46,300	233	39,000
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)	XX	130,000 [r]	XX	135,000	XX	157,000
Total	XX	784,000 [r]	XX	893,000 [r]	XX	982,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2

INDIANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	74 [r]	49,100 [r]	$261,000 [r]	74	51,600	$295,000
Dolomite	18	9,750	60,200	16	7,320	54,100
Total	XX	58,900 [r]	321,000 [r]	XX	58,900	349,000

[r]Revised. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	226	1,290
Riprap and jetty stone	483	3,470
Filter stone	99	754
Other coarse aggregate	1,610	6,030
Total	2,420	11,500
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,110	16,000
Bituminous aggregate, coarse	2,030	15,100
Bituminous surface-treatment aggregate	1,630	13,900
Railroad ballast	475	3,330
Other graded coarse aggregate	4,530	22,100
Total	10,800	70,400
Fine aggregate (-⅜ inch):		
Stone sand, concrete	50	402
Stone sand, bituminous mix or seal	477	2,790
Screening, undesignated	W	W
Other fine aggregate	2,210	7,710
Total	2,730	10,900
Coarse and fine aggregates:		
Graded road base or subbase	5,310	33,200
Unpaved road surfacing	388	2,680
Crusher run or fill or waste	1,280	5,560
Other coarse and fine aggregates	5,540	33,400
Total	12,500	74,900
Other construction materials[2]	61	476
Agricultural:		
Limestone	977	4,770
Poultry grit and mineral food	(3)	(3)
Other agricultural uses	365	1,280
Total	1,340	6,060
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Flux stone	(4)	(4)
Glass manufacture	(4)	(4)
Sulfur oxide removal	(4)	(4)
Special:		
Whiting or whiting substitute	(4)	(4)
Other fillers or extenders	(4)	(4)
Other miscellaneous uses and specified uses not listed	142	758
Unspecified:[5]		
Reported	16,400	115,000
Estimated	8,200	44,000
Total	24,600	159,000
Grand total	58,900	349,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes pipe bedding.

[3] Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4
INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	507	2,710	156	1,290	1,750	7,540
Coarse aggregate, graded[3]	4,160	31,500	1,840	14,400	4,780	24,500
Fine aggregate (-⅜ inch)[4]	479	2,520	169	992	2,090	7,400
Coarse and fine aggregates[5]	3,720	21,500	2,030	13,200	6,770	40,200
Other construction materials[6]	--	--	49	414	12	62
Agricultural[7]	773	3,540	131	766	438	1,750
Chemical and metallurgical[8]	W	W	W	W	W	W
Special[9]	W	W	W	W	W	W
Other miscellaneous uses	3	17	--	--	139	741
Unspecified:[10]						
Reported	4,090	28,500	9,760	70,200	2,580	16,100
Estimated	1,400	7,600	3,600	19,000	3,200	17,000
Total	15,700	100,000	18,000	123,000	25,200	126,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes pipe bedding.

[7] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8] Includes cement and glass manufacture, flux stone, and sulfur oxide removal.

[9] Includes whiting or whiting substitute and other fillers or extenders.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,730	$39,200	$5.07
Plaster and gunite sands	51	501	9.83
Concrete products (blocks, bricks, pipe, decorative, etc.)	135	1,140	8.45
Asphaltic concrete aggregates and other bituminous mixtures	1,470	8,070	5.50
Road base and coverings[2]	1,870	13,300	7.10
Fill	2,770	12,700	4.59
Snow and ice control[3]	508	1,860	3.66
Other miscellaneous uses	45	309	6.91
Unspecified:[4]			
Reported	6,190	33,600	5.42
Estimated	8,530	42,800	5.02
Total or average	29,300	153,000	5.24

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (cement and lime).

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	2,360	10,000	3,320	21,300	2,230	9,560
Asphaltic concrete aggregates and and road base materials[3]	817	4,750	2,320	15,600	203	1,020
Fill	805	2,850	1,770	8,910	191	935
Other miscellaneous uses[4]	96	462	445	1,640	13	65
Unspecified:[5]						
Reported	379	2,180	3,820	21,100	2,000	10,300
Estimated	2,330	11,700	2,870	14,400	3,330	16,700
Total	6,800	32,000	14,500	82,800	7,970	38,600

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

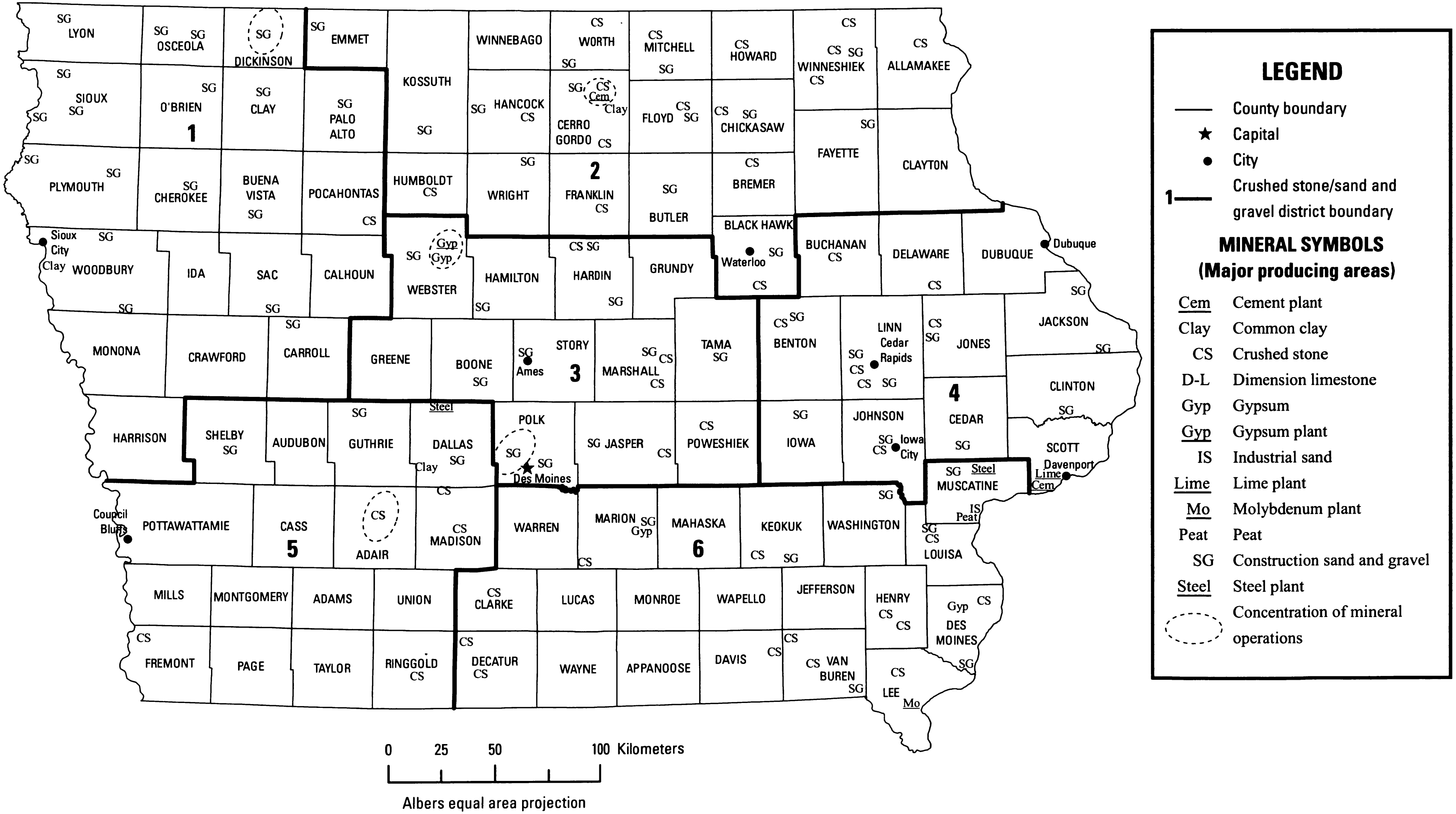
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes snow and ice control and filtration.

[5] Reported and estimated production without a breakdown by end use.

IOWA



Source: Iowa Geological Survey and Land Qualtity Bureau/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF IOWA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Iowa Geological Survey and Land Quality Bureau for collecting information on all nonfuel minerals.

In 2006, Iowa's nonfuel raw mineral production[1] was valued at $696 million, a 5%, or a $35 million, increase from that of 2005, based upon annual U.S. Geological Survey data. This followed a 24%, or $127 million, increase in the State's total nonfuel mineral production value for 2005 from that of 2004. The State was 31st in rank (29th in 2005) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total. Yet, per capita, the State ranked 16th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of nearly 3 million, the value of production was nearly $234 per capita.

Crushed stone, cement (portland and masonry), construction sand and gravel, and gypsum (in descending order of value) were Iowa's leading nonfuel mineral commodities in 2006, accounting for more than 97% of the State's total nonfuel mineral value. Crushed stone, cement, and crude gypsum led the State's increase in value with increases of $17 million, about $16 million, and more than $10 million, respectively. These were offset somewhat by decreases in the values of construction sand and gravel, down by more than $6 million, common clays, down by almost $2 million, and industrial sand and gravel, down by somewhat less. The production of all of these mineral commodities decreased by marginal to small amounts, except in the case of crude gypsum, which had a significant increase in production (table 1).

In 2006, Iowa continued to be 2d in the quantities of crude gypsum produced and to be a significant producer of crushed stone, portland cement (13th), construction sand and gravel, and common clays (descending order of value). No metals were mined in Iowa; the State's metal production, including molybdenum and raw steel, came from the processing of materials acquired from other domestic and foreign sources.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN IOWA[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	325	1,150	630	4,740	356	2,750
Gemstones, natural	NA	2	NA	2	NA	3
Sand and gravel, construction	17,100	74,300	19,900	93,100	17,500	86,700
Stone, crushed	35,800	219,000	36,400 [r]	271,000 [r]	36,300	288,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)	XX	239,000	XX	292,000	XX	319,000
Total	XX	534,000	XX	661,000 [r]	XX	696,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

IOWA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	174 [r]	34,500 [r]	$257,000 [r]	181	32,200	$257,000
Dolomite	34	1,940	14,200	4	4,070	31,200
Total	XX	36,400 [r]	271,000 [r]	XX	36,300	288,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	248	1,890
Riprap and jetty stone	178	2,000
Filter stone	304	2,920
Other coarse aggregate	124	1,090
Total	854	7,910
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,610	15,300
Bituminous aggregate, coarse	636	6,450
Bituminous surface-treatment aggregate	255	1,860
Railroad ballast	W	W
Other graded coarse aggregate	29	336
Total	2,530	23,900
Fine aggregate (-⅜ inch):		
Stone sand, concrete	114	1,100
Stone sand, bituminous mix or seal	313	2,720
Screening, undesignated	283	1,320
Other fine aggregate	46	378
Total	756	5,520
Coarse and fine aggregates:		
Graded road base or subbase	3,730	29,500
Unpaved road surfacing	2,980	21,800
Crusher run or fill or waste	230	938
Roofing granules	(2)	(2)
Other coarse and fine aggregates	807	7,390
Total	7,750	59,600
Other construction materials	138	1,370
Agricultural:		
Limestone	994	5,270
Poultry grit and mineral food	(3)	(3)
Other agricultural uses	384	4,940
Total	1,380	10,200
Chemical and metallurgical:		
Lime manufacture	(4)	(4)
Flux stone	(4)	(4)
Glass manufacture	(4)	(4)
Special, asphalt fillers or extenders	(4)	(4)
Other miscellaneous uses and specified uses not listed	64	571
Unspecified:[5]		
Reported	10,300	82,600
Estimated	11,000	88,000
Total	21,600	170,000
Grand total	36,300	288,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3] Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4
IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2[2]		Districts 3 and 4[2]		Districts 5 and 6[2]		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	203	1,420	363	3,550	286	2,920	3	33
Coarse aggregate, graded[4]	678	5,370	1,010	9,500	833	9,030	3	37
Fine aggregate (-⅜ inch)[5]	211	949	115	713	350	3,290	80	565
Coarse and fine aggregate[6]	2,310	13,600	1,790	14,200	3,120	27,400	519	4,290
Other construction materials	--	--	138	1,370	--	--	--	--
Agricultural[7]	396	1,630	569	5,830	392	2,620	22	125
Chemical and metallurgical[8]	--	--	W	W	--	--	--	--
Special[9]	--	--	W	W	--	--	--	--
Other miscellaneous uses	64	571	--	--	--	--	--	--
Unspecified:[10]								
Reported	4,790	38,300	2,950	23,600	2,500	20,000	98	761
Estimated	2,800	21,000	7,000	55,000	1,500	12,000	--	--
Total	11,400	83,300	15,200	121,000	8,990	77,200	725	5,810

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2, 3 and 4, and 5 and 6 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[4] Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8] Includes lime and glass manufacture and flux stone.

[9] Includes asphalt fillers or extenders.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,810	$10,200	$5.64
Plaster and gunite sands	112	413	3.67
Asphaltic concrete aggregates and other bituminous mixtures	84	228	2.72
Road base and coverings	2,010	5,850	2.92
Road and other stabilization (lime)	3	16	6.23
Fill	685	2,390	3.49
Snow and ice control	77	390	5.04
Other miscellaneous uses[2]	14	194	14.12
Unspecified:[3]			
Reported	9,030	49,100	5.44
Estimated	3,650	18,000	4.93
Total or average	17,500	86,700	4.97

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes roofing granules.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		District 2 and 4		Districts 3 and 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	390	2,320	936	5,290	184	1,120
Asphaltic concrete aggregates and and road base materials[4]	1,230	3,330	601	1,600	183	737
Fill	275	653	155	642	133	701
Other miscellaneous uses[5]	22	98	32	311	36	167
Unspecified:[6]						
Reported	1,510	8,210	217	1,390	332	1,700
Estimated	1,010	4,880	1,340	6,860	6,930	37,300
Total	4,440	19,500	3,280	16,100	7,800	41,700

	District 6		Unspecified districts	
Use	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	409	1,870	--	--
Asphaltic concrete aggregates and and road base materials[4]	--	--	77	426
Fill	122	396	--	--
Other miscellaneous uses[5]	1	8	--	--
Unspecified:[6]				
Reported	169	1,120	--	--
Estimated	1,180	5,650	--	--
Total	1,880	9,040	77	426

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 2 and 4 and 3 and 5 are combined to avoid disclosing company proprietary data.

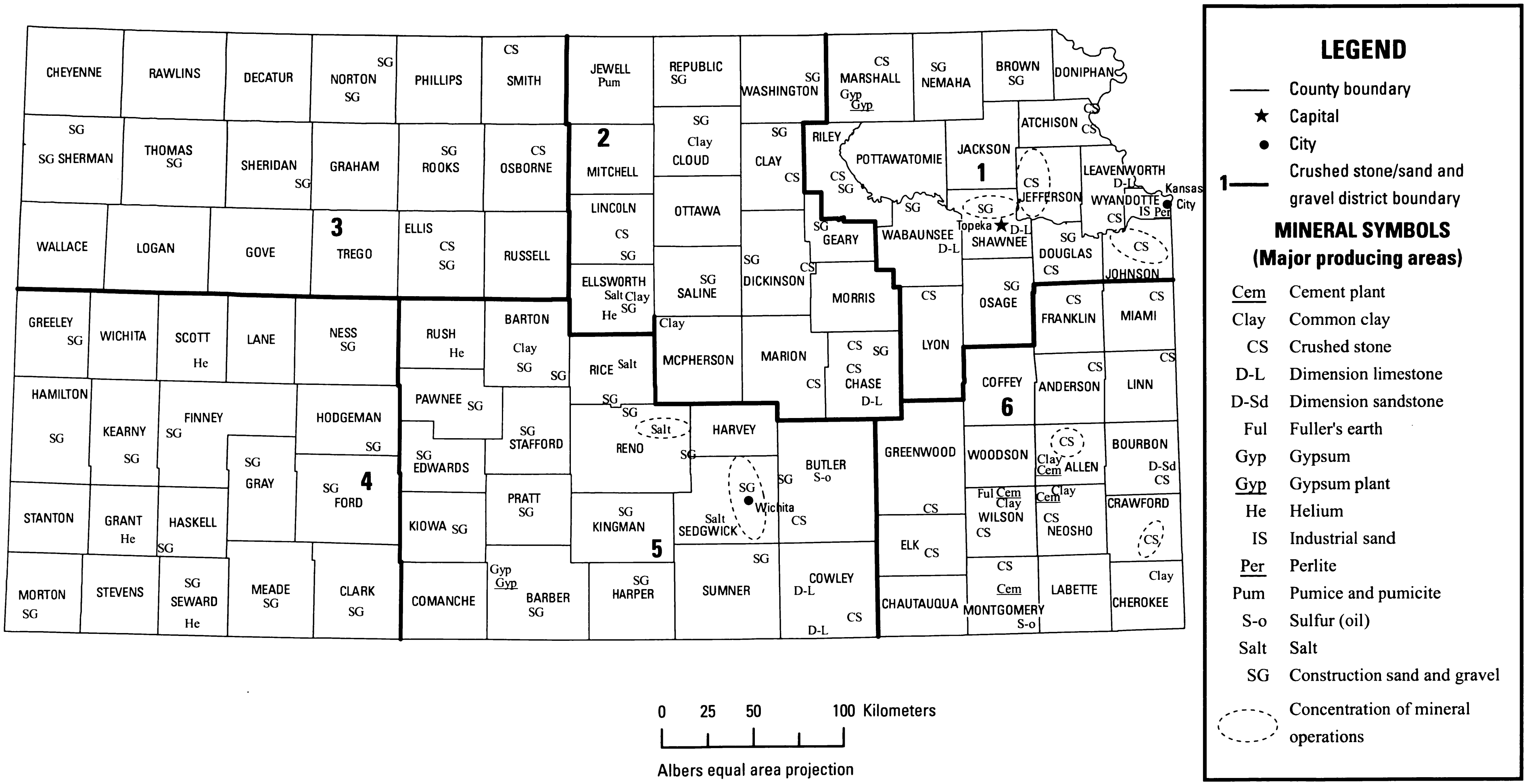
[3] Includes plaster and gunite sands.

[4] Includes road and other stabilization (lime).

[5] Includes snow and ice control and roofing granules.

[6] Reported and estimated production without a breakdown by end use.

KANSAS



Source: Kansas Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF KANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kansas Geological Survey for collecting information on all nonfuel minerals.

In 2006, Kansas' nonfuel raw mineral production[1] was valued at $973 million, based upon annual U.S. Geological Survey (USGS) data. This represents an increase of $101 million, or 11.6%, from the State's total nonfuel mineral production value of 2005, following a $104 million, or 13.5%, increase from 2004 to 2005. The State was 24th in rank among the 50 States in total nonfuel mineral production value, of which Kansas accounted for nearly 1.5% of the U.S. total. Yet, per capita, the State ranked 12th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of slightly more than 2.76 million, the value of production was about $352 per capita.

Portland cement, Grade-A helium, crushed stone, and salt were Kansas' leading nonfuel mineral commodities in 2006, accounting for about 29%, 25%, 18%, and 15%, respectively, of the State's total nonfuel mineral production value, and collectively about 87%. In 2006, all of Kansas' nonfuel mineral commodities increased in value except for gemstones, which was unchanged. The most substantial increases took place in the values of portland cement (up by about $42 million), Grade-A helium (up by $19 million), construction sand and gravel (up by $13 million), and crushed stone (up by $10 million), and salt (up by $9 million); the unit values of each also showed significant increases. Although the increases in the values of common clays and industrial sand and gravel were comparatively small, by percentage of increase, these two commodities showed the largest increases, up 62% and 53%, respectively (table 1).

In 2006, Kansas continued to be the Nation's leading producer of Grade-A helium and of crude helium (first of 2 producing States). The State decreased to sixth from fifth in the quantities of salt produced. Additionally, significant quantities of portland cement, crushed stone, construction sand and gravel, crude gypsum, and common clays (in descending order of value) were produced in the State. Production of nonfuel minerals in Kansas has consisted entirely of industrial minerals since 1970, following nearly a century (since 1877) of metallic mineral mining.

The following narrative information was provided by the Kansas Geological Survey (KGS)[2].

Mine Development and Employment

During 2006, there were a total of 1,113 permitted mining sites for nonfuel minerals. The private sector operated 133 mines at 465 sites, while 59 county governments conducted mining operations at 648 mining sites. There was a decrease by 10 in the number of private operators and a decrease in the number of mining sites by 41. Most of these decreases took place in limestone and sand and gravel operations. The number of county government operations remained the same during 2006; however, the number of mining sites operating throughout the State increased by 59. The State had an overall increase of 15.4% in mining employment including employment in oil and gas. Excluding employees in the oil and gas industry, mining industry employees totaled 1,209, with an average salary of $41,261. This salary represents a 2.7% increase from that of 2005. There was a decrease of 4.6% in total number of mining employees, mainly in the limestone and gravel industries.

Exploration Activities, Mine Reclamation and Awards

In 2006, the Kansas Department of Transportation funded several studies of limestone units in search of high-quality limestone for use in high-quality concrete and highway construction. The studies took place in Douglas, Franklin, and Miami Counties. Mining of nonfuel minerals in Kansas during 2006 resulted in 337 mined hectares (ha) and 145 reclaimed ha. The State nonfuel mining reclamation program was started in 1994. Since that time, a total of 1,600 mined hectares have been reclaimed and released. The Kansas Governor's Mined Land Reclamation Award for 2006 went to Hamm Quarries, Inc. of Perry, KS, for reclamation operations at its Grantville Quarry.

Legislation and Government Activities

During the 2006 legislative session, the "Silica and Asbestos Claims Act" was signed into law by the Governor. This act specifies that physical impairment of an exposed person is to be an essential element in any civil action alleging a silica or asbestos claim.

The 2006 Kansas Geological Survey Field Conference was organized and led primarily by members of the Kansas Geological Survey and cosponsored with several other State agencies. The conference's theme centered on environmental problems associated with the lead-zinc Tri-State Mining Region of southeast Kansas and border areas of Missouri and Oklahoma. The main objective of the field conference was to inform the Kansas Legislature and other State government officials on the environmental problems associated with past mining and the efforts taken to correct problems. Information on the field conference, including background material, is available from the Kansas Geological Survey (Open-file Report 2006–21) (Sawin and others, 2006).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Lawrence L. Brady, Senior Scientific Fellow at the Kansas Geological Survey, in consultation with Dr. Dennis Baker of the State Conservation Commission, authored the text of the State's mineral industry information provided by that agency.

Geologic mapping continued, with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Mapping Program, which is congressionally mandated by the National Cooperative Geologic Mapping Program (NCGMP). The USGS distributes Federal funds through NCGMP to support geologic mapping efforts utilizing a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Geologic mapping during 2006 was conducted in Dickerson, Edwards, Geary, Saline, and Washington Counties. Additional geologic mapping in the EDMAP program was conducted in Jewell and Norton Counties by the University of Kansas with cooperation from the KGS. A map of Osborne County was published in 2006, with field mapping by Kenneth R. Neuhauser (Neuhauser, 2006). Several county geologic maps with completed field geologic mapping were in the preparation and review stages.

References Cited

Neuhauser, K.R., 2006, Geologic map of Osborne County: Kansas Geological Survey Map Series M-102, scale 1:5,000.

Sawin, R.S., Buchanan, R.C., Evans, C.S., McCauley, J.R., and Lyle, S.A., 2006, Kansas field conference, field guide, 2006 field conference, the Tri-State region-boundaries and natural resources: Kansas Geological Survey Open-file Report, 2006–21, variously paginated.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN KANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,690	212,000 [e]	2,890	244,000 [e]	3,000	286,000 [e]
Clays:						
Common	621	7,460	654	4,590	697	7,440
Gemstones, natural	NA	1	NA	1	NA	1
Helium, Grade–A million cubic meters	82	189,000	90	226,000	85	245,000
Salt	2,890	127,000	2,890	135,000	2,630	144,000
Sand and gravel, construction	9,930	32,800	10,100	36,900	12,100	50,000
Stone:						
Crushed	20,600	122,000	22,300 [r]	160,000 [r]	22,000	171,000
Dimension	14	1,730	13	1,590	17	2,270
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)	XX	75,300	XX	63,100	XX	67,400
Total	XX	768,000	XX	872,000 [r]	XX	973,000

[e] Estimated. [r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

TABLE 2

KANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	116 [r]	21,700 [r]	$156,000 [r]	105	21,000	$163,000
Quartzite	2	599	4,310	2	996	7,880
Total	XX	22,300 [r]	160,000 [r]	XX	22,000	171,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	175	2,580
Filter stone	242	2,100
Other coarse aggregate	8	58
Total	425	4,740
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Railroad ballast	W	W
Fine aggregate (-⅜ inch):		
Screening, undesignated	W	W
Other fine aggregate	1	6
Coarse and fine aggregates:		
Graded road base or subbase	(2)	(2)
Unpaved road surfacing	373	1,380
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	46	431
Other coarse and fine aggregates	530	2,340
Total	1,880	9,540
Other construction materials	51	170
Agricultural, limestone	W	W
Chemical and metallurgical, cement manufacture	W	W
Unspecified:[3]		
Reported	9,610	75,800
Estimated	7,200	57,000
Total	16,800	132,000
Grand total	22,000	171,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	--	--
Coarse and fine aggregate[6]	W	W	W	W	122	373
Other construction materials	51	170	--	--	--	--
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Unspecified:[9]						
Reported	3,720	29,400	1,440	11,400	--	--
Estimated	3,000	24,000	--	--	--	--
Total	8,070	62,100	2,920	21,200	122	373

Use	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--
Fine aggregate (-⅜ inch)[5]	--	--	--	--
Coarse and fine aggregate[6]	--	--	407	1,790
Other construction materials	--	--	--	--
Agricultural[7]	--	--	W	W
Chemical and metallurgical[8]	--	--	W	W
Unspecified:[9]				
Reported	151	1,190	4,290	33,900
Estimated	830	6,600	3,300	26,000
Total	984	7,760	9,940	79,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 4.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes concrete aggregate (coarse), bituminous aggregate (coarse), and railroad ballast.

[5] Includes screening (undesignated) and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[7] Includes agricultural limestone.

[8] Includes cement manufacture.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,910	$8,230	$4.32
Plaster and gunite sands	34	121	3.53
Asphaltic concrete aggregates and other bituminous mixtures	529	2,810	5.31
Road base and coverings[2]	1,430	6,010	4.21
Fill	1,140	3,360	2.96
Snow and ice control	45	210	4.68
Other miscellaneous uses	26	318	12.21
Unspecified:[3]			
Reported	1,970	7,530	3.83
Estimated	4,980	21,400	4.29
Total or average	12,100	50,000	4.15

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		Districts 2 and 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	821	4,080	501	2,090	152	406
Asphaltic concrete aggregates and and road base materials[4]	140	796	457	2,390	714	3,320
Fill	293	1,060	241	1,010	27	70
Other miscellaneous uses[5]	33	280	21	189	7	25
Unspecified:[6]						
Reported	208	921	347	1,130	148	285
Estimated	2,200	9,090	642	2,660	695	3,650
Total	3,690	16,200	2,210	9,460	1,740	7,760

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	467	1,770	--	--	--	--
Asphaltic concrete aggregates and and road base materials[4]	644	2,300	--	--	--	--
Fill	577	1,220	--	--	--	--
Other miscellaneous uses[5]	10	33	--	--	--	--
Unspecified:[6]						
Reported	1,000	4,120	--	--	262	1,080
Estimated	1,420	5,860	29	119	--	--
Total	4,120	15,300	29	119	262	1,080

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 2 and 3 are combined to avoid disclosing company proprietary data.

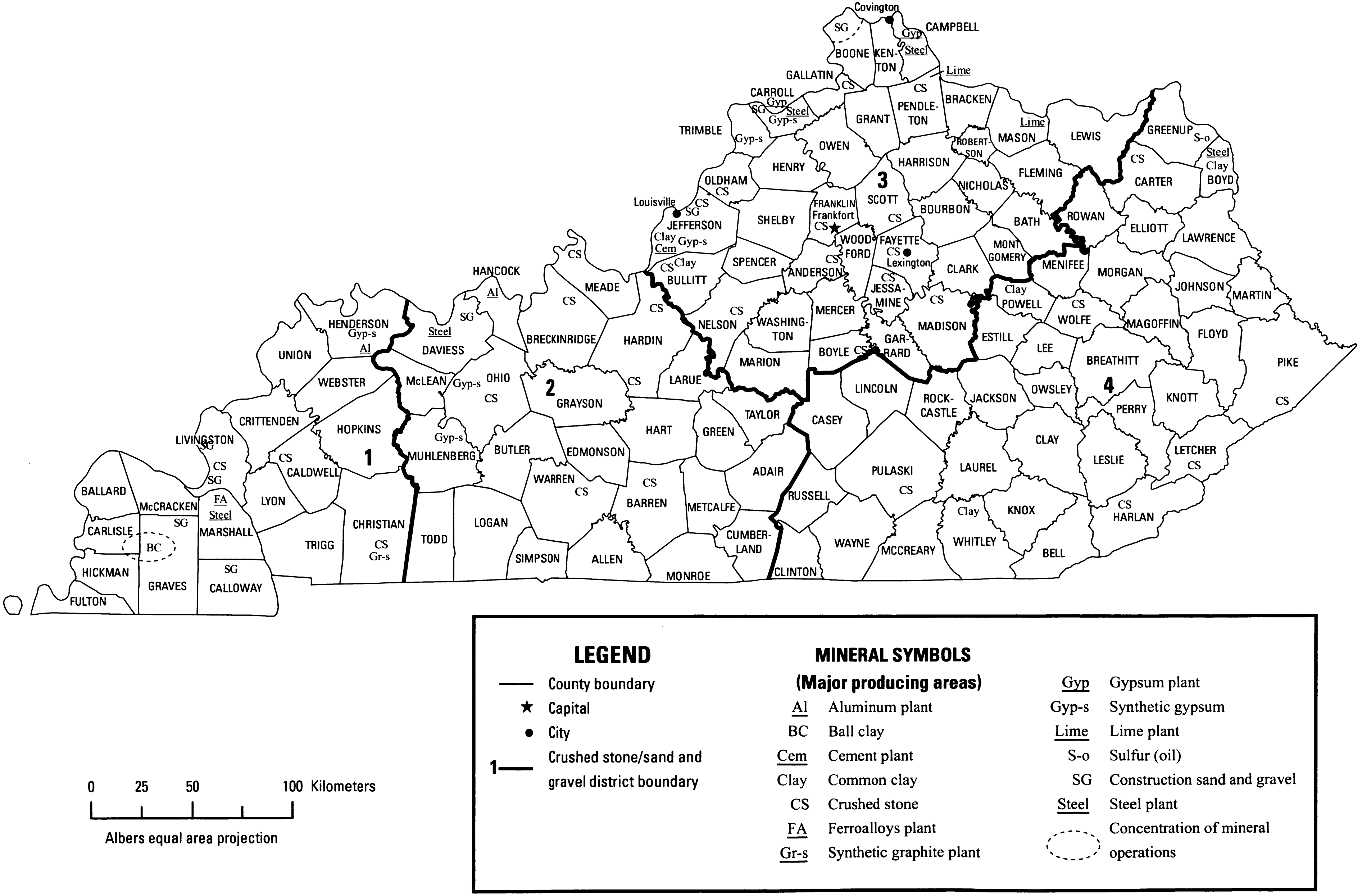
[3] Includes plaster and gunite sands.

[4] Includes road and other stabilization (lime).

[5] Includes snow and ice control.

[6] Reported and estimated production without a breakdown by end use.

KENTUCKY



LEGEND

County boundary
★ Capital
● City
1 Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS

(Major producing areas)

Al	Aluminum plant
BC	Ball clay
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
FA	Ferroalloys plant
Gr-s	Synthetic graphite plant
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
Lime	Lime plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
◌	Concentration of mineral operations

Source: Kentucky Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF KENTUCKY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kentucky Geological Survey for collecting information on all nonfuel minerals.

In 2006, Kentucky's nonfuel raw mineral production[1] was valued at $806 million, based upon annual U.S. Geological Survey (USGS) data. This was a $24 million, or 3.1%, increase from the State's total nonfuel mineral production value of 2005, and followed a $91 million, or more than 13%, increase in the State's value from 2004 to 2005. Kentucky rose to 26th from 27th in rank among the 50 States in total nonfuel mineral production value, accounting for more than 1% of the U.S. total. Yet, per capita, the State ranked 18th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 4.2 million, the value of production was about $192 per capita.

Crushed stone continued to be Kentucky's leading nonfuel mineral commodity in 2006 and accounted for 54% of the State's raw nonfuel mineral value. Lime was second, followed by cement (portland and masonry) and construction sand and gravel. These four mineral commodities accounted for about 98% of the State's total nonfuel mineral production value. In 2006, Kentucky's increase in value was mostly the result of increases in the values of portland cement and lime of more than $15 million each, the unit values of each showing modest increases. Increases also took place in the values of ball clay, common clays, and masonry cement. The largest decrease took place in crushed stone, down by $11 million. Although having minimal effect on the State's total nonfuel mineral value, the value of gemstones was down by 39% in 2006 from that of 2005 (table 1).

In 2006, Kentucky continued to rank 4th in the quantities of ball clay produced, and the State produced significant quantities of crushed stone (11th in rank), portland cement, and construction sand and gravel (descending order of value). Kentucky decreased in rank to third from second in the production of lime and to eighth from seventh in that of common clays. Additionally, primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. Kentucky remained the Nation's leading producer of primary aluminum.

The following narrative information was provided by the Kentucky Geological Survey[2] (KGS).

Exploration Activities

Hastie Fluorspar Mining and Moodie Minerals Inc. continued fluorite exploration in the Western Kentucky Fluorspar District. Core drilling results from the Klondike Mine area in Livingston County showed significant evidence of fluorspar mineralization along the fault systems. The companies planned to continue core drilling in 2007 to evaluate the potential for opening a mine at the site (Greb and Anderson, 2007).

The KGS and the Department of Geological Sciences at the University of Kentucky continued to examine dikes in the Coefield Creek ultramafic intrusive complex in Crittenden County. Alkalic lamprophyre dikes were tentatively identified as alnoites (Heck and others, 2006).

Startups, Acquisitions and Upgrades

Rinker Materials Corporation, headquartered in West Palm Beach, FL, purchased four properties from Nally & Gibson Georgetown. The purchase consisted of three quarries and one concrete block plant in southeastern Kentucky along Pine Mountain (Greb and Anderson, 2007; Markley, 2007).

Alpha Natural Resources, Abingdon, VA, a supplier of coal to electric utility companies, began construction of the Gallatin Materials, LLC lime plant, located at the Sterling Materials Mine, in Verona, KY. Alpha had acquired a 77.5% interest in the Gallatin plant and planned to sell the produced lime to coal-burning utility companies as a scrubbing agent for removing sulfur dioxide from flue gases (Alpha Natural Resources, Inc., 2007).

Florida Tile Industries, Inc. was purchased by Panariagroup Industrie Ceramiche SPA, a publicly traded Italian Corporation, in February. In mid-September, a new state-of-the-art porcelain plant was commissioned at the Lawrenceburg plant site. The acquisition by Panariagroup represented a major investment in the U.S. ceramic tile market for the company (Florida Tile Industries, Inc., 2006).

Superior Graphite, Chicago, IL, a producer of graphite and carbon products at three plants in Hopkinsville, announced the expansion of its silicon carbide powder plant. The expansion of this advanced materials plant was intended to supply sufficient silicon carbide powder for the increased demand in the production of ceramic armor tiles (Lane Report, The, 2007).

Technology

The KGS completed a 2-year geochemical sampling program sponsored by the USGS National Geochemical Survey (NGS) through the collection of stream sediment samples across various portions of Kentucky. This program served to supplement earlier geochemical sampling acquired under the National Uranium Resource Evaluation program that was conducted in the 1970s. Data from the NGS program are documented in the Web site (http://tin.er.usgs.gov/geochem/doc/home.htm) and could provide valuable geochemical exploration information for companies exploring for metals and nonmetals in the State.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Warren H. Anderson, Geologist and Principal Investigator with the Kentucky Geological Survey, submitted the text of the State mineral industry information provided by that State agency.

The KGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

During 2006, the KGS completed a set of digital 1:100,000-scale geologic maps for the State, and many have been prepared for public distribution. A new series of derivative maps, termed Land Use maps, also were prepared based on the digital geology information. Potential limestone resources in the State were shown on these derivative maps. The KGS continued to release these maps via the KGS GeoPortal, an internet map server. This Web site, gsmap.uky.edu/website/KGSGeoPortal/KGSGeoPortal.asp, allows a user to download various types of geologic maps and data to create custom maps. Work also was continued on creating a minerals database and Geographic Information System that would be accessible via the internet and be a valuable means for public distribution of minerals information.

The University of Kentucky continued State funded research into carbon dioxide sequestration and its impact on underground limestone mining operations. Limited amounts of carbon dioxide were to be injected at a proposed carbon dioxide test site near the Duke Energy Power Plant in Boone County, in an effort to monitor the behavior and migration of the fluid. Monitoring wells were to be used to observe the subsurface fluid's behavior at the test site. Operators of an underground limestone mine, located approximately 16 kilometers to the south of the test site, had expressed concerns regarding the possibility of leakage or drainage of carbon dioxide into the underground mine. The depth to which carbon dioxide is injected into the ground at the powerplant to sequester the carbon dioxide generally exceeds that of any mine.

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN KENTUCKY[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	978	4,510	1,060	4,370	1,000	5,140
Gemstones, natural	NA	22	NA	78	NA	48
Sand and gravel, construction	10,300	49,700	10,500	55,000	10,100	54,400
Stone, crushed	62,100 [3]	384,000 [3]	61,600 [r]	446,000 [r]	59,000	435,000
Combined values of cement, clays (ball), lime, stone [crushed dolomite (2004)]	XX	253,000	XX	277,000 [r]	XX	311,000
Total	XX	691,000	XX	782,000 [r]	XX	806,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2

KENTUCKY: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	92 [r]	60,400 [r]	$438,000 [r]	92	59,000	$435,000
Dolomite	1	W	W	--	--	--
Granite	1	W	W	--	--	--
Total	XX	61,600 [r]	446,000 [r]	XX	59,000	435,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	304	2,300
Filter stone	227	1,510
Other coarse aggregate	1,290	9,440
Total	1,820	13,200
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,090	7,940
Bituminous aggregate, coarse	3,250	23,400
Bituminous surface-treatment aggregate	419	3,080
Railroad ballast	680	4,480
Other graded coarse aggregate	6,270	50,000
Total	11,700	88,800
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	759	6,100
Screening, undesignated	211	1,400
Other fine aggregate	3,470	24,600
Total	4,440	32,100
Coarse and fine aggregates:		
Graded road base or subbase	3,620	23,700
Unpaved road surfacing	470	2,900
Crusher run or fill or waste	256	1,620
Other coarse and fine aggregates	5,280	37,800
Total	9,630	66,000
Other construction materials	132	1,000
Agriculture:		
Limestone	655	3,700
Other agriculture uses	14	75
Total	669	3,780
Chemical and metallurgical, lime manufacture	(2)	(2)
Unspecified:[3]		
Reported	12,500	95,600
Estimated	18,000	130,000
Total	30,600	230,000
Grand total	59,000	435,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2[2]		Districts 3 and 4[2]	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	644	4,630	1,180	8,620
Coarse aggregate, graded[4]	5,170	38,400	6,540	50,500
Fine aggregate (-⅜ inch)[5]	1,580	11,500	2,860	20,600
Coarse and fine aggregate[6]	2,670	17,700	6,960	48,300
Other construction materials	130	991	2	9
Agricultural[7]	464	2,570	205	1,200
Chemical and metallurgical[8]	--	--	W	W
Unspecified:[9]				
Reported	4,290	31,800	8,170	63,800
Estimated	5,500	41,000	13,000	94,000
Total	20,400	148,000	38,600	287,000

W Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 and 3 and 4 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes agricultural limestone and other agricultural uses.

[8] Includes lime manufacture.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	7,080	$38,100	$5.38
Asphaltic concrete aggregates and road base materials[2]	272	1,520	5.58
Fill	181	851	4.70
Unspecified:[3]			
Reported	630	3,790	6.01
Estimated	1,940	10,200	5.24
Total or average	10,100	54,400	5.39

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	W	W	W	W	W	W	W	W
Asphaltic concrete aggregates and road base materials[2]	W	W	W	W	W	W	W	W
Fill	--	--	3	19	178	831	--	--
Other miscellaneous uses	1,270	5,240	129	746	5,760	32,800	195	829
Unspecified:[3]								
Reported	--	--	--	--	630	3,790	--	--
Estimated	959	5,020	145	758	785	4,110	49	259
Total	2,230	10,300	277	1,520	7,350	41,500	245	1,090

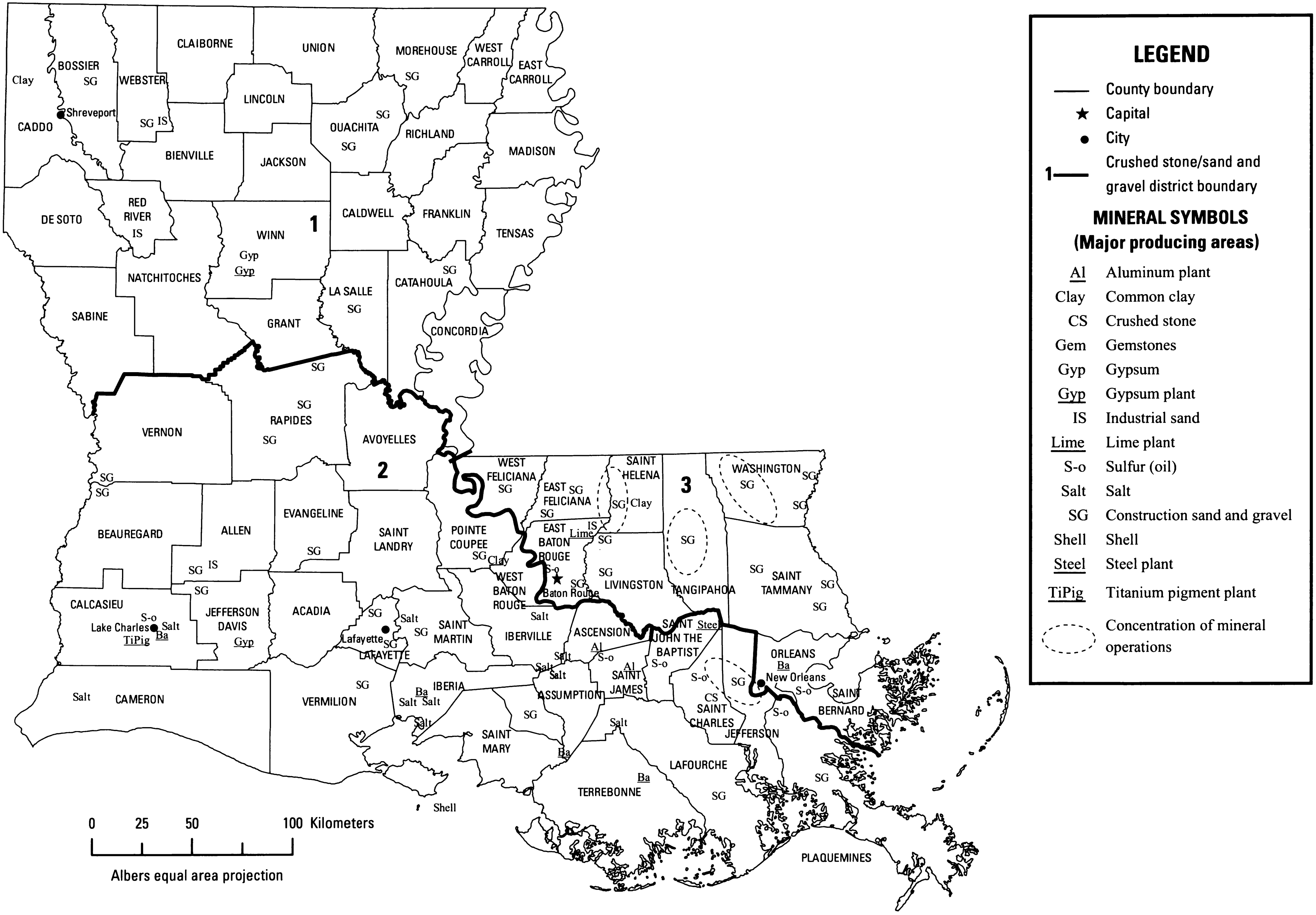
W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (lime)

[3] Reported and estimated production without a breakdown by end use.

LOUISIANA



Source: Louisiana Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF LOUISIANA

In 2006, Louisiana's nonfuel raw mineral production[1] was valued at $481 million, based upon annual U.S. Geological Survey (USGS) data. This was an $83 million, or nearly 21%, increase from the State's total nonfuel mineral value for 2005, which was up $32 million, or 8.7%, from that of 2004. Louisiana ranked 37th among the 50 States in total nonfuel mineral production value, and the State accounted for slightly less than 1% of the U.S. total.

In 2006, construction sand and gravel, accounting for about 39% of the State's total nonfuel mineral value, was Louisiana's leading nonfuel raw mineral, surpassing salt, which had led the State since it overtook sulfur in 1991. This was followed (descending order of value) by salt, making up about 33% of the State's value, and crushed stone[2] (all data withheld—company proprietary data). Common clays and industrial sand and gravel were next, accounting for about 5% and more than 3%, respectively, of the State's nonfuel mineral value, followed by gypsum, lime, and gemstones (table 1). Aluminum and raw steel were also produced, but these were produced from materials obtained from other domestic and foreign sources. Sulfur was produced as a byproduct of oil and gas production.

In 2005, increases mostly in the values of construction sand and gravel, crushed stone, and common clays led the State's increase in nonfuel mineral value for the year. A 25% increase in the production of construction sand and gravel resulted in a $75 million, or 66%, increase in the commodity's value. Common clays production rose by 35% with a more than $10.5 million, or more than 80%, increase in its value, and the production and value of industrial sand and gravel also increased, the value of which rose by about $4.5 million. A smaller yet significant increase also took place in the production and the value of lime (table 1).

Significant increases took place in crushed stone production and value in 2005 and in the mineral commodity's value in 2006 (same quantity produced), the majority of which for each year was sold or used but not mined in Louisiana, mostly shipped in from Mexico and Kentucky and other States. Additionally, an undetermined portion of crude gypsum was imported from neighboring States.

Louisiana continued to lead the Nation in the quantity of salt produced, being first out of 15 producing States. Additionally, the State was a significant producer of construction sand and gravel, common clays, industrial sand and gravel, and gypsum (listed in descending order of value).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN LOUISIANA[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common[3]	399	11,000	416	13,100	563	23,700
Gemstones, natural	NA	6	NA	6	NA	7
Salt	14,300	186,000	13,800	182,000	13,300	158,000
Sand and gravel:						
Construction	19,400	103,000	18,600	113,000	23,300	188,000
Industrial	476	14,800	509	11,600	663	16,100
Combined values of gypsum (crude), lime, stone (crushed limestone and sandstone, limestone, sandstone)	XX	51,300	XX	78,500 [r]	XX	95,400
Total	XX	366,000	XX	398,000 [r]	XX	481,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers) and imports of stone mainly from Kentucky and Mexico.

[2] Data are rounded to three significant digits; may not add to totals shown.

[3] Sold or used.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Crushed stone quantity and value data were mostly from that of imported materials sold through sales yards, not from materials mined within the State (except for a relatively small portion of crushed shell mined instate). District tables for crushed stone were discontinued in 2005 in order to not disclose company proprietary data.

TABLE 2
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

(Thousand metric tons and thousand dollars)

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,040	$55,500	$7.87
Asphaltic concrete aggregates and other bituminous mixtures	234	2,010	8.57
Road base and coverings[2]	1,420	21,800	15.35
Fill	752	2,620	3.48
Other miscellaneous uses[3]	154	2,400	15.60
Unspecified:[4]			
Reported	5,800	42,900	7.40
Estimated	7,880	60,800	7.72
Total or average	23,300	188,000	8.07

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (cement).

[3] Includes railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

TABLE 3
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2		Districts 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,640	15,500	5,410	40,000	--	--
Asphaltic concrete aggregates and road base materials	1,060	18,500	598	5,310	--	--
Fill	557	2,100	195	522	--	--
Other miscellaneous uses[3]	104	1,400	49	996	--	--
Unspecified:[4]						
Reported	4,040	30,000	995	7,200	768	5,720
Estimated	3,280	25,300	4,600	35,500	--	--
Total	10,700	92,800	11,800	89,500	768	5,720

-- Zero.

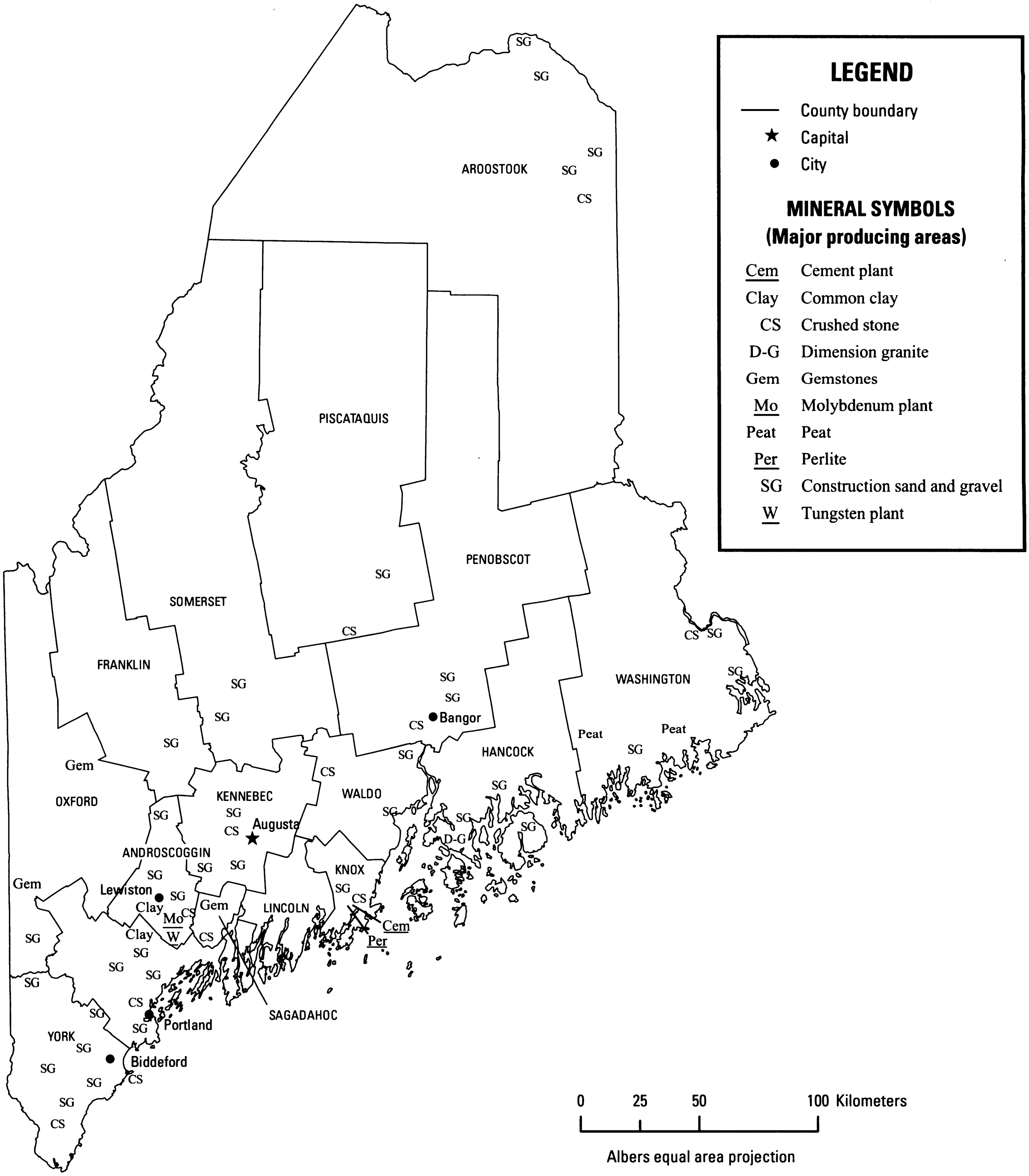
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3] Includes railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

MAINE



Source: Maine Geological Survey/ U.S. Geological Survey (2006).

The Mineral Industry of Maine

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maine Geological Survey for collecting information on all nonfuel minerals.

In 2006, Maine's nonfuel raw mineral production[1] was valued at $158 million, based upon annual U.S. Geological Survey data. This was a $17 million, or 12%, increase from that of 2005, which was up 19.5% from that of 2004. The large majority of the State's nonfuel mineral production resulted from the mining and production of construction minerals and materials—construction sand and gravel, portland cement, crushed stone, and dimension granite (descending order of value).

Construction sand and gravel and crushed stone accounted for 63% of Maine's total nonfuel raw mineral production value in 2006. All the State's nonfuel mineral commodities rose in value in 2006 except that of dimension stone which remained the same as in 2005. Increases in the values of crushed stone of $6.8 million and construction sand and gravel of $5 million led the State's increase in total value for the year (table 1). Smaller yet significant increases also took place in portland cement, masonry cement, and peat (in descending order of change).

In 2006, Maine rose to 6th in the production of peat following lower levels of production of recent past years and to 11th from 12th in the production of gemstones (based upon value). Additionally, significant quantities of construction sand and gravel were produced in the State.

The following narrative information was provided by the Maine Geological Survey[2] (MGS).

Exploration Activities

Owing to increasing metal prices, the Maine Geological Survey received inquiries from mining companies for information regarding and the status of identified mineral deposits in the State. The only activity on State-owned land was related to the Alder Pond exploration claim. After more than 7 years of exploration work, International Paper Co. allowed its claim on the 42-hectare (105-acre) Alder Pond prospect in Somerset County, northwestern Maine, to lapse. In 2006, a private party from Toronto, Ontario, Canada, subsequently staked a new claim on this property, beneath which a portion of a significant copper-lead-zinc-silver sulfide deposit extends, but no additional exploration activity was conducted on this claim during the year. This deposit, which was estimated to hold about 3.1 million metric tons of resources, was discovered in 1985.

In late 2006, geologists from Golden Hope Mines (Toronto) visited the MGS offices to collect information on the Big Hill deposit of Pembroke, Washington County, in eastern Maine which they had acquired. This deposit has been known since the 1960s and 1970s when a drilling program identified several high-grade silver intercepts. The copper-lead-zinc-silver mineralization is hosted in the mixed volcanic rocks of the Silurian Leighton Formation, which include rhyolitic and dacitic lapilli tuffs and basalt flows. The company planned to perform a geophysical survey in early 2007.

Commodity Review

Industrial Minerals

Gemstones.—The Mount Mica Mine in Paris, Oxford County, western Maine, was operated for gem tourmaline. This famous pegmatite deposit was discovered in 1820 and has been worked intermittently since that time. It is currently yielding multicolored tourmalines, including gemstock and crystal specimens for collectors. Other pegmatite minerals, such as quartz crystals, lapidary-grade masses of purple lepidolite mica, and occasional beryl crystals, typically also are recovered during the mining operation.

Other pegmatite deposits worked for gemstock and mineral specimens in 2006 included the Deer Hill amethyst mines in Stow, Oxford County (gemstock and specimens); Emmons Quarry and Noyes Mountain quarries in Greenwood, Oxford County (various collectible minerals); Fuller Mountain Quarry in Phippsburg, Sagadahoc County (beryl crystals); Georgetown tourmaline mine, Sagadahoc County; and Mount Marie Quarry in Paris, Oxford County (tourmaline, etc.). Production from these and other Maine pegmatites was generally in small quantities and sporadic, primarily for mineral collectors and lapidaries.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Robert G. Marvinney, Director and State Geologist, authored the text of the State mineral industry information provided by the Maine Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MAINE[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	49	W	50	W	48	W
Gemstones, natural	NA	268	NA	272	NA	275
Sand and gravel, construction	10,800	49,100	11,100	57,400	10,400	62,400
Stone, crushed	4,370	29,500	4,450 [r]	30,800 [r]	4,920	37,600
Combined values of cement [masonry (2004, 2006), portland], peat, stone (dimension granite), and values indicated by the symbol W	XX	39,300	XX	52,400	XX	57,400
Total	XX	118,000	XX	141,000	XX	158,000

[r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MAINE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	5	1,940	$12,500	5	1,850	$12,900
Granite	6	1,730	12,400	7	2,220	17,900
Traprock	(2)	W	W	4	W	W
Quartzite	2	480 [r]	3,520 [r]	2	474	3,750
Slate	1	25	168	1	16	124
Miscellaneous stone	2	W	W	2	W	W
Total	XX	4,450 [r]	30,800 [r]	XX	4,920	37,600

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Sales/distribution yards.

TABLE 3
MAINE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	24	218
Other coarse aggregate	20	131
Total	44	349
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Other graded coarse aggregate	45	387
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Screening, undesignated	(3)	(3)
Other fine aggregate	20	208
Total	48	346
Coarse and fine aggregates:		
Graded road base or subbase	(2)	(2)
Other coarse and fine aggregates	1,960	16,400
Chemical and metallurgical, cement manufacture	(2)	(2)
Unspecified:[4]		
Reported	531	3,980
Estimated	1,400	11,000
Total	1,910	14,600
Grand total	4,920	37,600

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Withheld to avoid disclosing company proprietary data; included in "Total."

[4] Reported and estimated production without a breakdown by end use.

TABLE 4
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	597	$3,520	$5.90
Asphaltic concrete aggregates and other bituminous mixtures	601	5,880	9.79
Road base and coverings[2]	1,880	10,800	5.77
Fill	836	3,380	4.04
Snow and ice control	360	2,060	5.73
Other miscellaneous uses[3]	28	191	6.72
Unspecified:[4]			
Reported	934	5,870	6.29
Estimated	5,200	30,700	5.89
Total or average	10,400	62,400	5.98

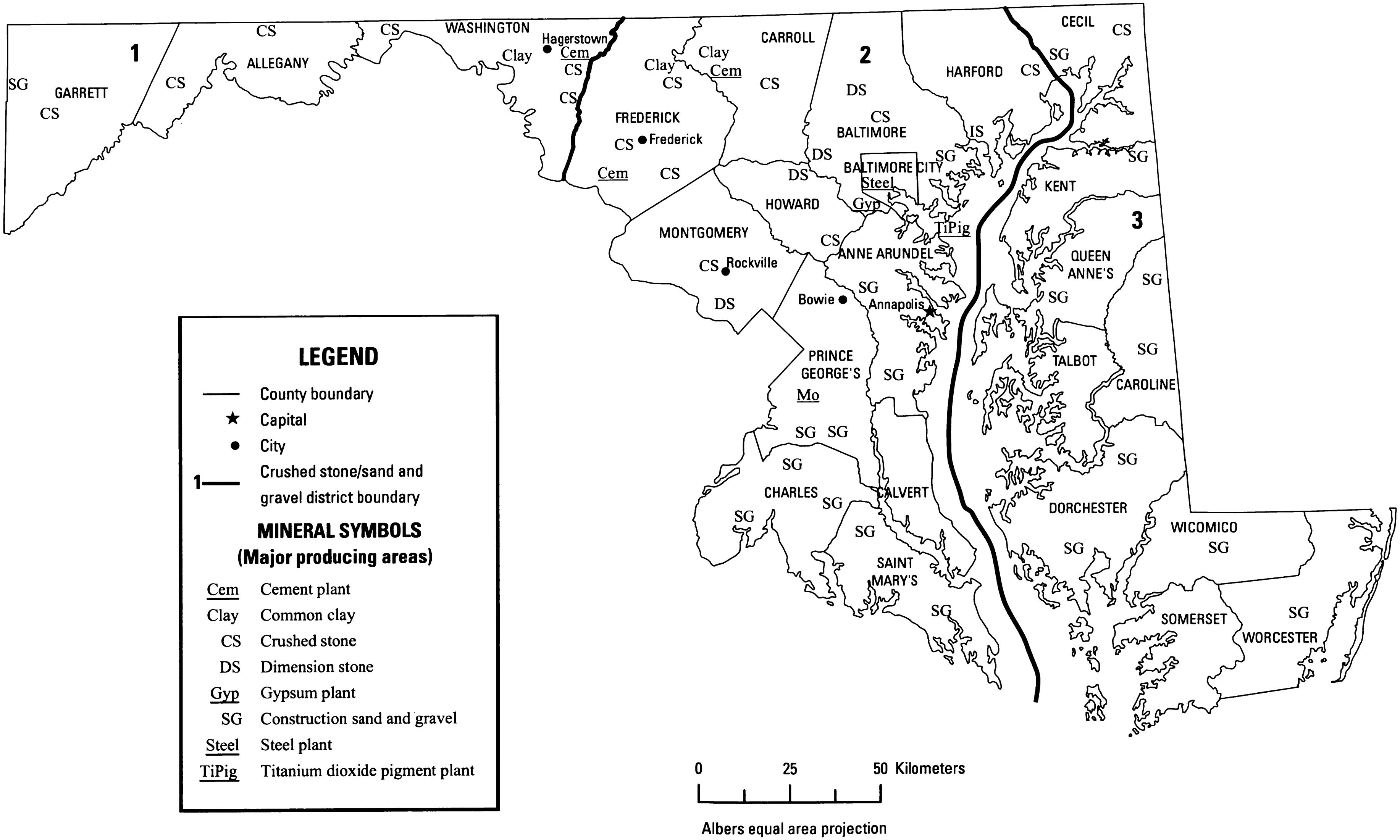
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road base and other stabilization (cement and lime).

[3] Includes filtration and railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

MARYLAND



Source: Maryland Department of the Environment/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MARYLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maryland Department of the Environment, Minerals, Oil, and Gas Division, for collecting information on all nonfuel minerals.

In 2006, Maryland's nonfuel raw mineral production[1] was valued at $653 million, based upon annual U.S. Geological Survey (USGS) data (table 1). This was an increase of $73 million, up 12.6% from the State's 2005 total value of $580 million, which followed a $106 million, or more than 22%, increase from 2004 to 2005[2]. The State ranked 33d among the 50 States in total nonfuel raw mineral production value and accounted for nearly 1% of the U.S. total value.

Crushed stone, portland cement, construction sand and gravel, and masonry cement, based upon value, were Maryland's leading nonfuel raw mineral commodities, the first three of which accounted for more than 99% of the State's reportable total nonfuel mineral value. In 2006, although crushed stone production was down slightly more than 4%, its $40 million rise in value, a more than 14% increase, led the way in Maryland's increase in total value. This was followed by increases in portland cement and construction sand and gravel values. Portland cement production rose 4%, accounting for a $27 million, or nearly 13%, increase in value, and construction sand and gravel value was up $7 million, despite a small decrease in production (table 1). A moderate decrease took place in masonry cement production, the value of which was down by about $4 million, and no production of industrial sand and gravel was reported to the USGS.

All nonfuel minerals mined in Maryland were industrial minerals. In 2006, the State continued to be a producer of significant quantities of crushed stone, portland cement, construction sand and gravel, and common clays (descending order of value), as compared with that of other producing States. All metal production, especially that of raw steel, consisted of the processing and refining of materials received from other domestic and foreign sources.

The narrative information that follows was provided by the Maryland Department of the Environment's (MDE) Mining Program[3]. In 2006, Maryland's mining operations continued to be very active with the production of aggregate related materials continuing at a brisk pace, overall, following the same level of production of the past several years.

Commodity Review

Industrial Minerals

Sand and Gravel, Construction.—Schuster Concrete opened a new sand production and wash plant in Caroline County on the Eastern Shore of Maryland. This 40-hectare (99-acre) site is located more that 120 kilometers (75 miles) from the major urban areas of Baltimore and Washington, DC, but is indicative of the lack of available lands for mining in the more densely developed population areas of the State. The material will be moved by way of trucks from the Caroline County location to markets mainly on the Western Shore of the Chesapeake Bay, where market demand outpaces available resources. The land will be reclaimed with open lakes and returned to agriculture land.

Stone, Crushed.—H.B. Mellott Estate, Inc. expanded its Beaver Creek quarry by adding an additional 29 ha (72 acres) of available reserves. This limestone mine was used for aggregate-related production and is located just east of Hagerstown in Washington County. The permit process was prolonged for several months to address issues of historical concern and ground water impacts. As of yearend, mining had only been permitted to the upper reaches of ground water.

The Blue Mount quarry has been in existence since 1902. Production of stone, however, has been minimal for the past 20 years. The quarry was purchased by Patuxent Materials, Inc. from Blue Mount Quarry, Inc. in 2006 and the permit was transferred to them. Active stone production will resume supplying aggregate material to the northern Baltimore County and southern York area of Pennsylvania.

Environmental Issues and Mine Reclamation

With land values high and demand growing for residential and commercial properties, a considerable amount of discussion took place regarding the enhanced reclamation of quarry sites as potential projects for the upcoming years. A demand for disposal space for dredge spoils from the Baltimore harbor was the subject of a special committee working for the Maryland State Legislature tasked with securing such sites, some of which could include abandoned mine sites. No agreements were reached, with talks still in the exploratory stages, but there was growing interest in transforming what once were abandoned mine sites into land development projects at no cost to the public. No new mining-related State legislation was introduced in 2006.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Because data for industrial sand and gravel (2004-05) and masonry cement were withheld (company proprietary data), the actual total values for those years are higher than those reported in table 1.

[3] C. Edmon Larrimore, Program Manager of the Mining Program of the MDE, authored the text of the State mineral industry information provided by that agency.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MARYLAND[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Cement, portland	2,520	175,000 e	2,550 r	210,000 e	2,650	237,000 e
Clays, common	262	571	317	686	286	851
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	12,700	75,500	12,300	89,500	11,900	96,700
Stone:						
Crushed	35,300	214,000	33,500 r	277,000 r	32,000	317,000
Dimension	27	9,580	26	3,010	14	1,750
Combined values of cement (masonry), sand and gravel [industrial (2004–05)]	XX	(3)	XX	(3)	XX	(3)
Total	XX	474,000	XX	580,000 r	XX	653,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

[3] Value withheld to avoid disclosing company proprietary data.

TABLE 2

MARYLAND: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone[2]	18	21,400	$181,000	20	21,200	$218,000
Granite	3	6,020 r	42,700 r	4	5,960	54,400
Sandstone	1	W	W	1	W	W
Shell	1	322	2,730	--	--	--
Traprock	3 r	W	W	2	W	W
Total	XX	33,500 r	277,000 r	XX	32,000	317,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	273	2,220
Filter stone	W	W
Other coarse aggregate	181	2,750
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,140	16,100
Bituminous aggregate, coarse	1,060	6,520
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	2,680	31,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	699	5,530
Screening, undesignated	W	W
Other fine aggregate	1,040	12,100
Coarse and fine aggregates:		
Graded road base or subbase	2,690	16,300
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	636	5,910
Roofing granules	W	W
Other coarse and fine aggregates	2,830	27,900
Other construction materials	444	4,120
Agricultural, limestone	W	W
Chemical and metallurgical:		
Cement manufacture	3,620	62,500
Lime manufacture	W	W
Sulfur oxide removal	W	W
Unspecified:[2]		
Reported	6,450	59,800
Estimated	5,100	48,000
Total	11,600	107,000
Grand total	32,000	317,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	6,680	52,900	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	4,560	42,000	--	--
Other construction materials	--	--	444	4,120	--	--
Agricultural[6]	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--
Unspecified:[8]						
Reported	1,400	13,000	4,720	43,800	326	3,030
Estimated	--	--	780	7,200	4,400	40,000
Total	4,380	41,900	23,000	232,000	4,680	43,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6] Includes agricultural limestone.

[7] Includes cement and lime manufacture and sulfur oxide removal.

[8] Reported and estimated production without a breakdown by end use.

TABLE 5
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,920	$61,000	$8.82
Plaster and gunite sands	121	1,060	8.75
Asphaltic concrete aggregates and other bituminous mixtures	232	1,540	6.61
Road base and coverings	223	2,310	10.36
Fill	686	2,810	4.09
Other miscellaneous uses[2]	289	2,240	7.76
Unspecified:[3]			
Reported	1,000	6,060	6.05
Estimated	2,400	19,700	8.22
Total or average	11,900	96,700	8.15

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes snow and ice control.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	3,600	38,000	3,440	24,100
Asphaltic concrete aggregates and road base materials	440	3,750	15	96
Fill	445	1,740	241	1,070
Other miscellaneous uses[3]	20	165	269	2,080
Unspecified:[4]				
Reported	969	5,830	33	231
Estimated	2,020	16,600	379	3,140
Total	7,490	66,000	4,380	30,700

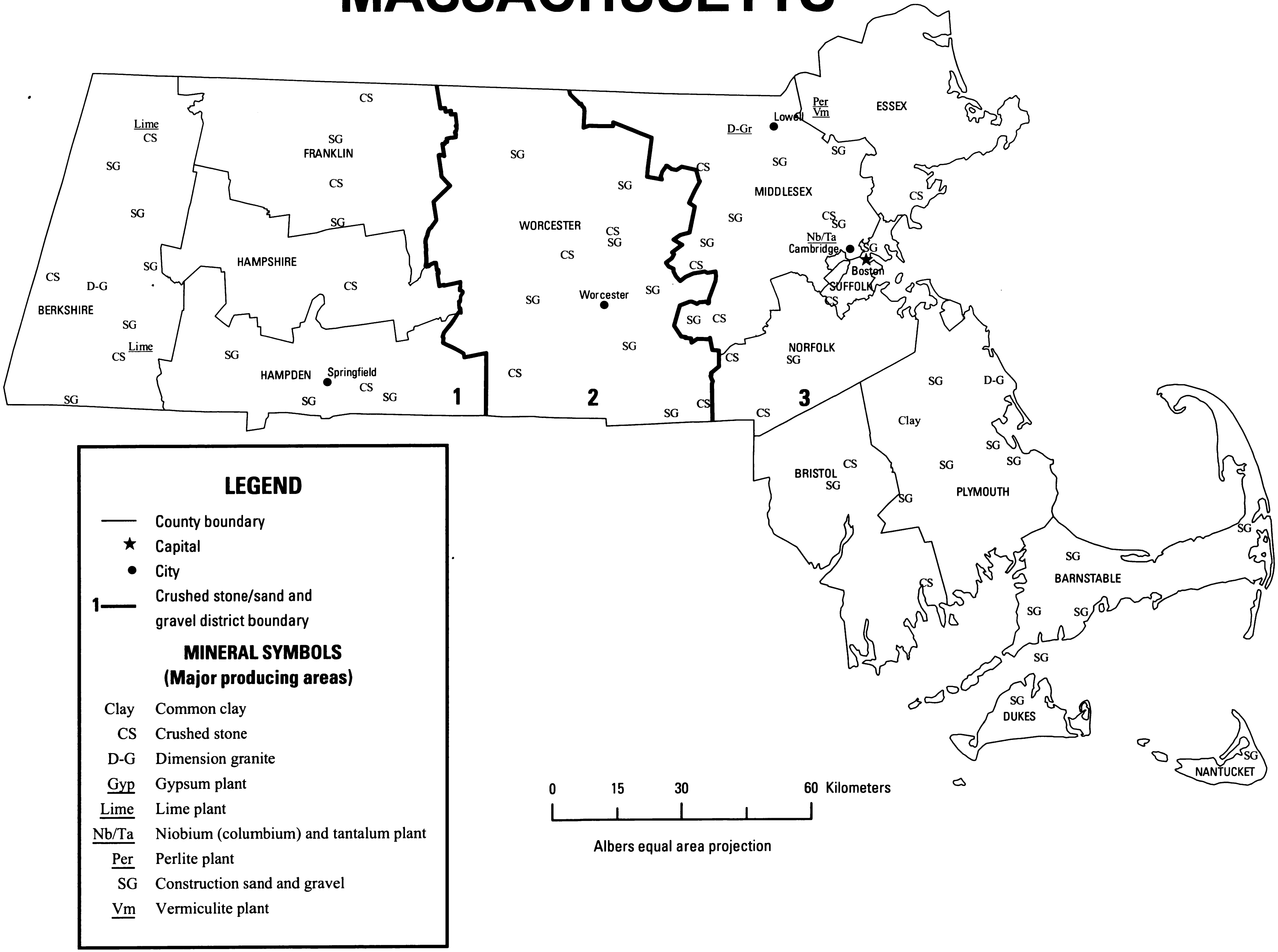
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3] Includes snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

MASSACHUSETTS



Source: Massachusetts Executive Office of Environmental Affairs/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MASSACHUSETTS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Massachusetts Office of the State Geologist for collecting information on all nonfuel minerals.

In 2006, Massachusetts nonfuel raw mineral production[1] was valued at $294 million, based upon annual U.S. Geological Survey data. This was a $44 million, or a 17.6% increase from the State's total nonfuel mineral value in 2005, which then had increased by $39 million, up more than 18% from that of 2004. Massachusetts leading nonfuel mineral commodities were, in descending order of value, crushed stone, construction sand and gravel, and lime, the former two commodities accounting for 96% of the State's total value. Because data for lime and common clays (2004–06) have been withheld, the State's actual total nonfuel mineral values for 2004–06 are significantly higher than those reported in table 1.

Crushed stone led the State's increase in value in 2006, up by $28 million (a 23% increase), despite a somewhat marginal decrease in production. Construction sand and gravel production rose by 7%, leading to a $17 million, or more than 14%, increase in the commodity's value (table 1). With about the same quantities produced as in 2005, the values of dimension stone and gemstones were unchanged. While the value of common clays was up slightly, a relatively small drop in lime production resulted in a slight decrease in the commodity's value. In 2006, the State rose in rank to fourth from fifth in the quantities of dimension stone produced; additionally, the quarries and sand pits in Massachusetts continued to produce significant quantities of crushed stone and construction sand and gravel as compared with that of the other producing States.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MASSACHUSETTS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	36	(3)	37	(3)	36	(3)
Gemstones, natural	NA	1	NA	1	NA	1
Lime	W	(3)	W	(3)	W	(3)
Sand and gravel, construction	14,400	89,900 r	16,500	117,000	17,600	134,000
Stone:						
Crushed	13,700	109,000	14,500 r	121,000	14,300	149,000
Dimension	82	11,600	82	11,500	82	11,500
Total	XX	211,000	XX	250,000	XX	294,000

r Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2

MASSACHUSETTS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	2	1,000	$16,000	2	887	$17,600
Dolomite	1	W	W	1	W	W
Granite	9	4,740 [r]	30,900	8	5,180	54,000
Traprock	18	8,180 [r]	68,600	17	7,990	74,600
Miscellaneous stone	1	W	W	(3)	W	W
Total	XX	14,500 [r]	121,000	XX	14,300	149,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

[3] Sales/distribution yards.

TABLE 3

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Other coarse aggregate	969	1,200
Coarse aggregate, graded, other	192	1,640
Fine aggregate (-⅜ inch), other	181	2,500
Coarse and fine aggregates:		
Graded road base or subbase	88	726
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	37	324
Other construction materials[2]	W	W
Agricultural:		
Limestone	W	W
Poultry grit and and mineral food	W	W
Chemical and metallurgical:		
Lime manufacture	W	W
Dead burned dolomite	W	W
Flux stone	W	W
Special:		
Whiting or whiting substitute	W	W
Other fillers or extenders	W	W
Unspecified:[3]		
Reported	7,270	75,300
Estimated	5,600	50,000
Total	12,900	125,000
Grand toal	14,300	149,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes building products.

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	W	W
Coarse aggregate, graded[3]	--	--	--	--	192	1,640
Fine aggregate (-⅜ inch)[4]	--	--	--	--	181	2,500
Coarse and fine aggregates[5]	W	W	--	--	W	W
Other construction materials[6]	W	W	--	--	--	--
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	--	--	658	5,810	6,610	69,500
Estimated	2,400	21,000	2,400	21,000	870	7,700
Total	3,020	36,100	3,060	27,000	8,230	86,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes riprap and jetty stone and other coarse aggregate.

[3] Includes other graded coarse aggregate.

[4] Includes other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes building products.

[7] Includes agricultural limestone and poultry grit and mineral food.

[8] Includes lime manufacture, dead-burned dolomite, and flux stone.

[9] Includes whiting or whiting substitute and other fillers or extenders.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5

MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,050	$34,200	$8.43
Plaster and gunite sands	48	447	9.35
Concrete products (blocks, bricks, pipe, decorative, etc.)	80	701	8.77
Asphaltic concrete aggregates and other bituminous mixtures	175	2,310	13.16
Road base and coverings	702	5,650	8.05
Fill	1,600	7,240	4.53
Snow and ice control	284	2,030	7.16
Filtration	460	2,860	6.21
Other miscellaneous uses	58	704	12.13
Unspecified:[2]			
Reported	2,930	21,800	7.45
Estimated	7,230	55,600	7.69
Total or average	17,600	134,000	7.58

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6

MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	1,340	13,800	1,020	5,620	1,820	15,900
Asphaltic concrete aggregates and road base materials	214	2,640	303	3,160	359	2,150
Fill	617	2,510	359	1,550	621	3,180
Ice and snow control[3]	20	176	576	3,790	149	925
Other miscellaneous uses	--	--	58	704	--	--
Unspecified:[4]						
Reported	430	2,400	600	4,260	1,900	15,100
Estimated	2,160	16,400	771	5,950	4,310	33,200
Total	4,780	37,900	3,690	25,000	9,150	70,500

-- Zero.

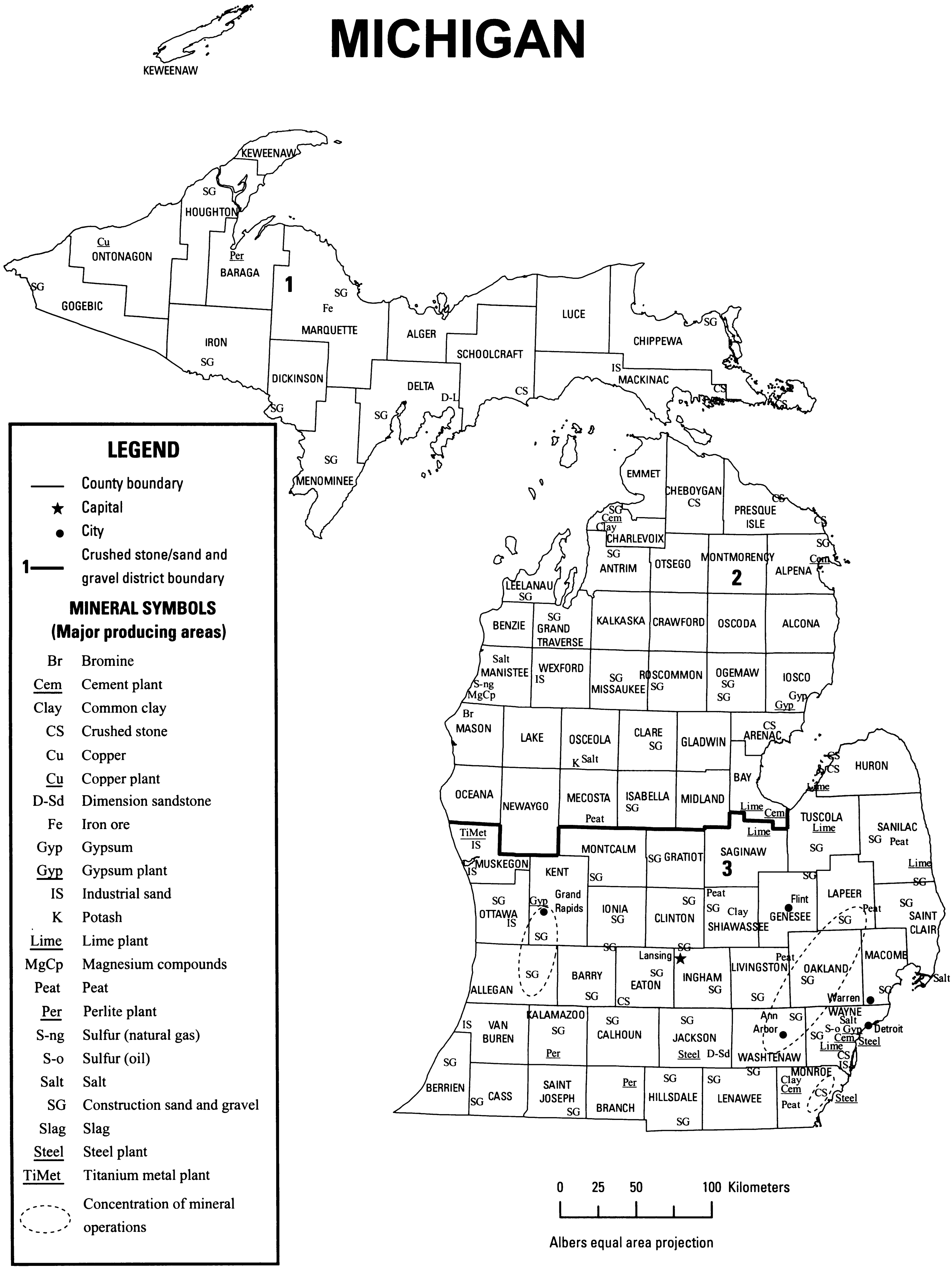
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

MICHIGAN



LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Major producing areas)

Br	Bromine
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
Fe	Iron ore
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
K	Potash
Lime	Lime plant
MgCp	Magnesium compounds
Peat	Peat
Per	Perlite plant
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Slag	Slag
Steel	Steel plant
TiMet	Titanium metal plant
◌	Concentration of mineral operations

Source: Michigan Department of Environmental Quality, Office of Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Office of Geological Survey, for collecting information on all nonfuel minerals.

In 2006, Michigan's nonfuel raw mineral production[1] was valued at $1.93 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $180 million, or 10.3%, increase from the State's total nonfuel mineral production value for 2005, which had increased by $70 million, or 4.2%, from 2004 to 2005. For the second consecutive year, the State was 11th in rank (ninth in 2004) among the 50 States in total nonfuel mineral production value, of which Michigan accounted for nearly 3% of the U.S. total.

Michigan continued to be the Nation's second leading iron ore-producing State in 2006, based upon value, and iron ore remained Michigan's leading nonfuel mineral commodity followed, in descending order of value, by cement (portland and masonry), construction sand and gravel, salt, crushed stone, magnesium compounds, and lime. The values of these nonfuel mineral commodities, combined, accounted for about 96% of the State's nonfuel raw mineral production value, the first five alone accounting for about 90% (table 1).

In 2006, increases in the values of iron ore, portland cement, and salt led Michigan's increase in nonfuel mineral production value. The production value of iron ore rose by significantly more than $120 million, despite a slight decrease in the quantity produced, and cement and salt also rose in value, by more than $20 million each, these the result of increases in both the production and the unit values of each of those nonfuel mineral commodities. Smaller yet significant increases took place in the values of bromine, crushed stone, industrial sand and gravel, lime, and magnesium compounds. The most substantial decrease took place in construction sand and gravel. Although the commodity's unit value rose by an annual average of nearly 14%, its total production value decreassed by $28 million (almost 12%), because of a 14.4 million metric ton (Mt), or 22%, decrease in the quantity produced. Significantly smaller decreases took place in the values of peat and potash (table 1).

In 2006, Michigan continued to be first in the quantities of magnesium compounds produced and second in the production of iron ore. The State again was second in bromine of two bromine-producing States, although production ceased in the State following the closing of Dow Chemical Co.'s bromine recovery facility in Mason County in December. The State continued to be third of three States that produce potash, fourth in construction sand and gravel, fifth in portland cement, seventh in salt, and ninth in masonry cement. The State rose to eighth from ninth in crude gypsum production but decreased to fifth from second in the production of peat and to ninth from sixth in industrial sand and gravel. Additionally, the State was a significant producer of crushed stone, lime, and common clays. Michigan was fourth in the Nation (third in 2005) in the manufacture of raw steel, with a nearly identical output in 2006 of 6.04 million metric tons (Mt) (6.05 Mt in 2005) (American Iron and Steel Institute, 2007, p. 74).

The following narrative information was provided by the Michigan Department of Environmental Quality (MDEQ), Office of the Geological Survey (MOGS), the Michigan Department of Natural Resources (MDNR), and the Forestry, Mineral, and Fire Management Division[2] (FMFM). Production, data and other information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' own research, surveys, and estimates. Mineral production data may differ from some production figures reported to the USGS.

Exploration, Development, and Reclamation

The MDEQ reported that three companies drilled 95 exploration drill holes for a total depth of 30,400 meters on State and private metallic mineral leases in 2006 (Hoane, 2007).

Kennecott Eagle Minerals applied to the MDEQ in early 2006 for permits to further develop its proposed nickel-copper Eagle Mine. The proposed mine would be located in the Yellow Dog Plains area of northern Marquette County. Three permit applications covering environmental assessments related to air and water quality and mining operations were submitted for regulatory review to the MDEQ (Kennecott Eagle Minerals, 2006a). The review process, however, was delayed several months pending a court ruling on legal challenges made by groups opposed to the development of the mine. In October, the Michigan Court of Appeals ruled that the review by the MDEQ could be resumed. Upon completion of this review process (including approval), additional MDEQ permits and MDNR approvals will be required prior to the start of mining (Kennecott Eagle Minerals, 2006b).

Aquila Resources Inc. completed a takeover transaction with JML Resources, Ltd. in May, and was accepted on the Toronto TSX Venture Exchange. In the transaction, JML Resources Ltd. acquired 100% of the shares of Aquila Resources Corp. in return for issuing more than 49 million common shares of JML (JML Resources Ltd., 2006a). The company name changed to Aquila Resources Inc. with its common shares listed under the trading symbol AQA and JML Resources was delisted (Aquila Resources Inc., 2006). The resulting issuer of stock

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] The text of the State mineral industry information was compiled and edited by Milton A. Gere, Jr., Geologist and Supervisor, Metallic and Nonmetallic Minerals and Underground Gas Storage Leasing Unit, Minerals and Land Management Section, Forest, Mineral, and Fire Management Division, Michigan Department of Natural Resources.

Aquila Resources controlled the mineral and surface rights to the Back Forty project in Menominee County. The project was in an advanced stage of exploration, targeting copper, gold, and zinc volcanogenic massive sulfide (VMS) mineralization (JML Resources Ltd., 2006b). Further drilling by Aquila Resources during the year on the Back Forty property intersected additional copper, gold, silver, and zinc VMS mineralization. The company planned to initiate a 2-year environmental monitoring program prior to applying for a mining permit (Whyte, 2006).

Bell Resources Corporation completed a seven-hole exploration-drilling program on its "A-Train Project" in the Upper Peninsula. The project area is regarded as highly prospective for deposits of copper, nickel, and platinum-group metals. All drill holes intersected intervals containing several volume percentage of disseminated to net-textured magmatic ore minerals. Platinum- and palladium-rich intersections were coplanar with copper- and palladium-rich outcrops (Bell Resources Corporation, 2006).

Bitterroot Resources Ltd. received and executed metallic mineral leases covering 1,980 hectares (ha) in the Upper Peninsula. Bitterroot and its joint-venture partner Cameco Corporation were expected to begin drill tests by yearend in several areas prospective for unconformity-hosted uranium deposits. These areas had previously been defined by electromagnetic and seismic geophysical methods (Bitterroot Resources Ltd., 2006).

A former sand and gravel mining pit complex was being reclaimed into wetland and residential lakefront living areas in Ypsilanti Township, Washtenaw County. In October, the series of lakes in the 144-ha property were stocked with six species of fish and cricket frogs. Earlier the banks of the former pit were graded and vegetated, replacing steep barren slopes. Several price levels of housing were planned for the reclaimed area. About 50% of the area was to remain as open space and natural habitat (Gordon, 2006).

Commodity Review

Industrial Minerals

Limestone and Dolomite.—Oglebay Norton announced that its subsidiary (Oglebay Norton Marine Services Company, LLC) had completed the sale of six of its nine marine vessels. The sales transaction also included contract provisions for transporting limestone from Oglebay's Michigan quarries. According to a company spokesperson, the move was intended to provide the company with an increased focus on its industrial sand, limestone, and limestone filler operations (Oglebay Norton, 2006). In another company action, Oglebay's limestone operations subsidiary (O-N Minerals Company) granted Wolverine Power Marketing Cooperative an option to purchase a 178-ha area at its Calcite Quarry near Rogers City. Wolverine was considering the use of the site for its clean energy projects, including a clean-coal technology process for electrical power generation. O-N Minerals would supply the high-quality chemical limestone for the process (Wolverine Power Marketing Cooperative, 2006).

Sand and Gravel, Construction.—The MDNR announced an agreement with Aggregate Resources Inc. permitting Aggregate Resources to lease the rights to produce sand and gravel from lands within the Waterloo State Recreational Area in Jackson County. The State, as part of the agreement, acquired the rights to the adjacent land previously mined by Aggregate Resources. The agreement required that Aggregate Resources would eventually reclaim all the mined land into a natural area with habitat for sand hill cranes and other wildlife (Hepker, 2006).

Balkema Excavating Inc. proposed a comprehensive plan that would involve transporting of its mined gravel through a piping system constructed under the Kalamazoo River at Plainwell. The plan was prompted by the need to reduce the flow of truck traffic during the periods of mining operation. Under the plan, a dredge would remove sand and gravel from a pit resulting in the creation of a manmade lake. The dredged material would travel in a pipe under the nearby river to a processing plant. The gravel would then be sold and the waste sand returned by pipe to build a beach area around the created lake. Included in the Balkema proposal was the construction of residences around the lake. The Plainwell City Planning Commission recommended that the Plainwell City Council approve the preliminary plan submitted by Balkema. A plan proposed by Balkema in 2003 that would have increased local truck traffic was opposed by nearby residents. The current proposed project would take 3 to 5 years to complete and require various permits from the MDNR and the MDEQ. The developer would also need to receive permits from the city for the project (Sturdevant, 2006).

Sand and Gravel, Industrial.—Nugent Sand Co. announced plans for a rail-loading facility in the Muskegon County Industrial Park facility in Dalton Township in order to significantly increase rail shipment from the industrial sand mine operated nearby. The rail-loading project would require road improvements and land purchases in the industrial park area, and installation of water and sewer facilities. A special use permit would be required for Nugent to conduct business at the site (Lemieux, 2006).

The MDEQ issued a permit to Nugent Sand Co. allowing the company to mine an additional 1.6 million cubic meters of industrial sand from Nugent's mine at Norton Shores, Muskegon County. The permit, which extends to 2011, would allow Nugent to expand its manmade North Lake by 7.7 ha through dredging to below the water table (Aggregates Manager, 2006).

A ruling by the Ingham County Circuit Court upheld a 2005 decision by the MDEQ to deny approval of a pipeline through a protected critical sand dune. The pipeline, requested by Nugent Sand Co., would have allowed the company to discharge the water from its high-grade sand processing plant into Lake Michigan. The circuit court judge agreed that the Michigan law requires the protection of critical dunes and that the proponents of the pipeline did not have a right to a special exemption from the law (Lake Effect, The, 2006).

Metals

Copper.—Michigan had a long history of being a major copper-producing State from about 1845 until about 1995. In 2006, there was no copper production. However, the Caledonia Mine in Ontonagon County operated by Red Metal Minerals produced limited amounts of copper and other related mineral specimens for sale to collectors and museums.

White Pine Copper Refinery, Inc., White Pine, MI, was purchased by HudBay Minerals Inc., Winnipeg, Manitoba, Canada. Purchase of the refinery allowed Hudson Bay Mining and Smelting Co., Ltd. (wholly owned subsidiary of Hudbay Minerals Inc.) to have a captive facility for refining the copper anodes produced at its operations in Manitoba (Hudbay Minerals Inc., 2006).

Iron Ore.—Cleveland-Cliffs Inc celebrated the production of its 500 millionth long ton of iron ore pellets in Michigan. From 1956 until March 2006, the company had operated a total of six separate iron ore pelletizing plants in Marquette County. In 2006, Cleveland-Cliffs operated two pelletizing plants as components of its Empire Mine and Tilden Mine. Cleveland-Cliffs employed about 1,400 people in the State during the year (Grand Rapids Press, The, 2006).

Cleveland-Cliffs continued to market its Republic iron mine property, which contained the Republic Dam, raising concerns by some residents of Republic Township, Marquette County. Changes in water levels controlled by the dam could affect properties owned by about 70 landowners in the area. The dam, which facilitated much of Republic Township's waterfront property, could not be removed without State permits. In January 2007, the property was sold to an undisclosed private party; the sale did not include 931 ha (2,300 acres) that made up the Republic Wetlands Preserve (Skillings Mining Review, 2007).

Government Activities

Cleveland-Cliffs and the MDEQ reached a negotiated settlement regarding a mercury pollution remediation case at Deer Lake in Marquette County. The action amended an existing 1984 judgment related to mercury levels in the lake. As part of the settlement, Cleveland-Cliffs volunteered additional remediation at Deer Lake including surrounding easements, land, and property. The company would also establish a lake restoration fund, and a program for testing the mercury levels in the resident fish. The MDEQ indicated that possible sources of mercury in the lake included waste rock from a former gold mine that used mercury in its ore processing, atmospheric deposition, and Cleveland-Cliff's disposal of heavy metals used for testing in its research laboratory (Skillings Mining Review, 2006).

The U.S. Federal Emergency Management Agency provided a $33,750 grant, 75% of the $45,000 cost to prevent ground water from flooding the lowest levels of the Cornish Pumping Engine and Mining Museum, Iron Mountain, MI. The balance of the repair cost was to be paid by the Menominee Range Historical Foundation. The flooding problem was attributed to the collapse of a mine shaft adjacent to the museum in 1999. That subsidence had been capped in 2000 with $150,000 from the MDNR's Abandoned Mine Fund.

There were 111 metallic mineral leases on State-owned mineral lands covering nearly 10,700 ha. An additional 96 leases covering about 9,310 ha were pending, owing to a hold on issuing new leases while a new lease document was under preparation and review. Total income from the metallic mineral leasing program was nearly $296,000 in 2006. There were 36 nonmetallic mineral leases on State-owned mineral lands covering nearly 1,190 ha in 2006, with an income of $778,686. An additional $29,400 income was obtained from Forest Management Division Mineral Permit activities (Hoane, 2007).

Most of the income from the Metallic and Nonmetallic Mineral Leasing programs is directed to the Michigan Natural Resources Trust Fund, which gives grants to the State and local governments to purchase and develop public recreational properties within the State.

The Millie Mine, Millie Hill, Dickinson County, MI, was reported to be the winter hibernating and breeding place for up to 50,000 Big Brown and Little Brown Bats. The Millie Hill location is one of several bat-inhabited abandoned mines in Michigan. It has become the first bat interpretive center within the State (Michigan Department of Natural Resources, 2006).

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	231	27,100 [e]	228	27,500 [e]	176	22,700 [e]
Portland	W	W	W	W	5,440	536,000 [e]
Clays, common	605	3,070	334	514	405	1,010
Gemstones, natural	NA	1	NA	1	NA	2
Gypsum, crude	452	5,660	1,050	10,700	1,050	9,980
Peat	122	3,360	117	3,300	W	W
Sand and gravel:						
Construction	69,500	254,000	64,800	243,000	50,500	215,000
Industrial	1,690	25,200	1,610	24,500	1,460	30,400
Stone, crushed	36,700 [3]	143,000 [3]	36,000 [r]	139,000 [r]	32,500	142,000
Combined values of bromine, iron ore (usable shipped), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone [crushed marl (2004), dimension dolomite and sandstone], and values indicated by the symbol W	XX	1,210,000	XX	1,300,000	XX	970,000
Total	XX	1,680,000	XX	1,750,000	XX	1,930,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2

MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	25	27,900	$108,000	25	25,300	$108,000
Dolomite	5	7,230 [r]	29,700 [r]	5	6,620	30,300
Calcareous marl	1	W	W	1	W	W
Traprock	--	--	--	1	W	W
Miscellaneous stone	2	W	W	1	19	150
Total	XX	36,000 [r]	139,000 [r]	XX	32,500	142,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	70	624
Filter stone	W	W
Other coarse aggregate	2,110	7,810
Total	2,180	8,430
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,340	19,100
Bituminous aggregate, coarse	515	4,220
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	48	532
Total	3,900	23,900
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Stone sand, bituminous mix or seal	729	3,700
Screening, undesignated	361	1,300
Other fine aggregate	455	1,730
Total	1,550	6,740
Coarse and fine aggregates:		
Graded road base or subbase	1,110	5,740
Unpaved road surfacing	474	2,830
Crusher run or fill or waste	21	96
Other coarse and fine aggregates	53	397
Total	1,660	9,060
Agricultural:		
Limestone	(4)	(4)
Other agricultural uses	(4)	(4)
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Flux stone	(2)	(2)
Total	9,530	31,400
Special, other fillers or extenders	(4)	(4)
Unspecified:[5]		
Reported	1,650	7,000
Estimated	12,000	53,000
Total	13,600	60,200
Grand total	32,500	142,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	W	W
Special[8]	--	--	W	W	--	--
Unspecified:[9]						
Reported	--	--	--	--	1,650	7,000
Estimated	19	150	9,200	39,000	2,700	14,000
Total	9,590	49,200	13,200	46,900	9,730	45,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes agricultural limestone and other agricultural uses.

[7] Includes cement and lime manufacture and flux stone.

[8] Includes other fillers or extenders.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,010	$32,500	$4.63
Plaster and gunite sands	18	85	4.62
Concrete products (blocks, bricks, pipe, decorative, etc.)	239	755	3.16
Asphaltic concrete aggregates and other bituminous mixtures	4,490	24,500	5.46
Road base and coverings	6,700	30,700	4.59
Road and other stabilization (cement)	186	969	5.22
Road and other stabilization (lime)	58	186	3.19
Fill	6,250	15,200	2.43
Snow and ice control	370	1,690	4.56
Filtration	44	217	4.91
Other miscellaneous uses	78	520	6.65
Unspecified:[2]			
Reported	4,390	19,800	4.52
Estimated	20,700	87,600	4.23
Total or average	50,500	215,000	4.25

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6

MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	427	2,950	712	3,490	6,130	26,900
Asphaltic concrete aggregates and road base materials[3]	1,770	8,170	2,670	11,500	6,990	36,700
Fill	247	382	340	755	5,660	14,100
Snow and ice control[4]	32	92	154	465	229	1,350
Other miscellaneous uses	4	47	3	28	71	444
Unspecified:[5]						
Reported	325	1,470	64	763	4,000	17,600
Estimated	976	4,140	3,700	15,600	16,000	67,900
Total	3,780	17,300	7,640	32,700	39,100	165,000

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

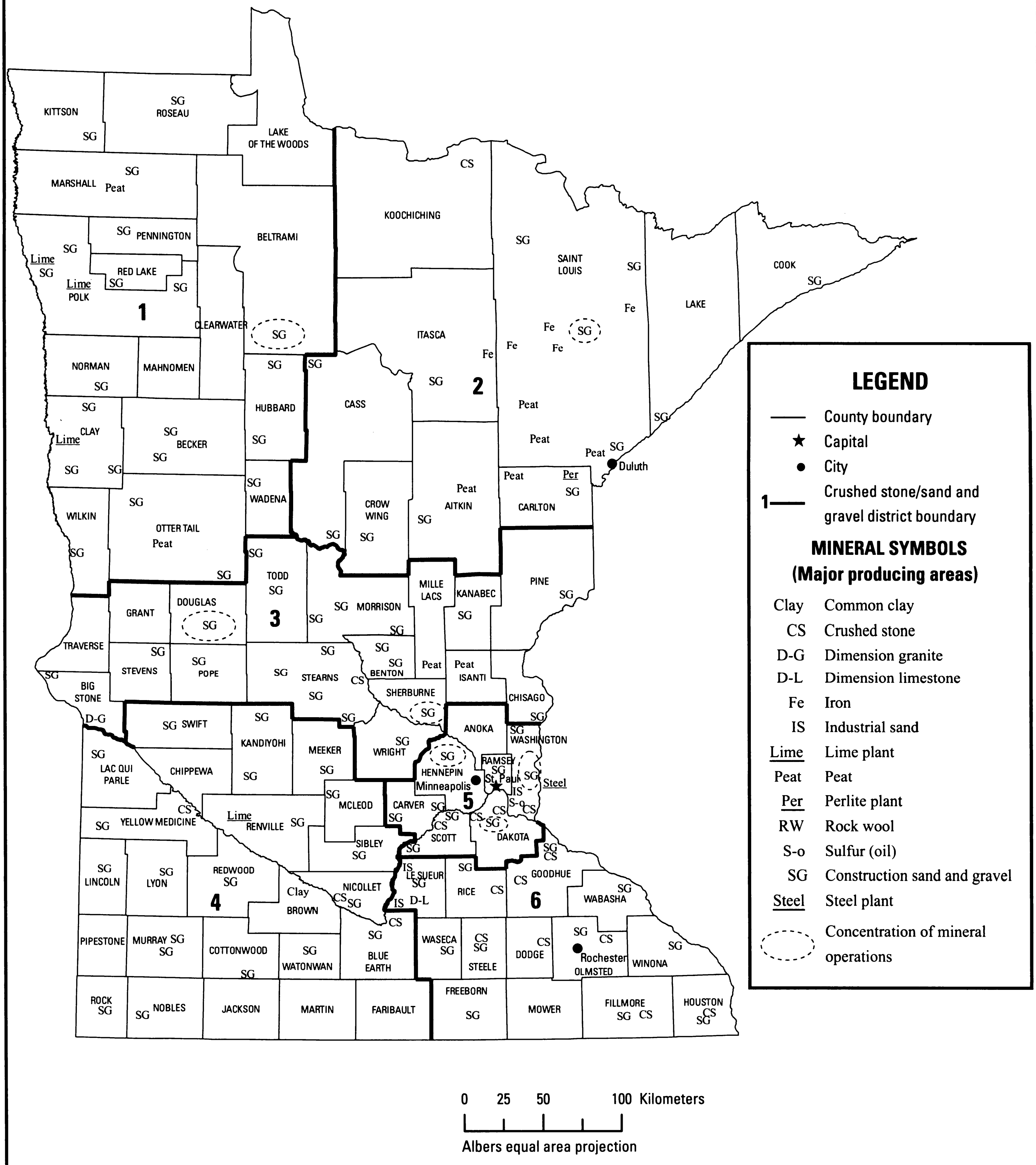
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes filtration.

[5] Reported and estimated production without a breakdown by end use.

MINNESOTA



Source: Minnesota Department of Natural Resources, Division of Lands and Minerals/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY MINNESOTA

In 2006, Minnesota's nonfuel raw mineral production[1] was valued at $2.54 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $350 million, or 16%, increase from the State's total nonfuel mineral value for 2005, which had increased by $310 million, or 16.5%, from 2004 to 2005. Minnesota ranked eighth (seventh in 2005) among the 50 States in total nonfuel mineral production value, and the State accounted for nearly 4% of the U.S. total. [Because data for industrial sand and gravel and lime have been withheld (company proprietary data), the actual total values for 2004–06 are noticeably higher than those reported in table 1.]

Minnesota continued to be the Nation's leading iron ore-producing State in 2006, and, based upon value, iron ore continued to be the State's leading nonfuel mineral, accounting for nearly 85% of its total nonfuel mineral production value. Iron ore was followed by construction sand and gravel, crushed stone, industrial sand and gravel, dimension stone, lime, peat, common clays, and gemstones (in descending order of value).

In 2006, for the third consecutive year, the State's substantial increase in nonfuel raw mineral production value largely resulted from iron ore's considerably higher average price per metric ton (t) compared with that of 2005. In 2006, despite a slight decrease (less than 1%) in the shipments of usable iron ore, the commodity's value increased by more than $330 million, or by 18%, compared with that of 2005, following the same trend as in 2004 and 2005 (table 1). In 2004 and 2005, the commodity's value increased by $530 million (more than 50%) and more than $270 million (17%), respectively, when compared with the values for the previous year. In 2004, iron ore production shipments increased by 22% and in 2005 it decreased by 2% compared with the previous year's production shipments. Other mineral commodities with particularly large increases in value were crushed stone and industrial sand and gravel. A more than 18% increase in the production of crushed stone resulted in a more than 38%, or nearly $34 million, rise in its value. In a similar manner, the production and value of industrial sand and gravel also increased. The largest decrease in value took place in that of construction sand and gravel. With a slight decrease in unit value, its production value decreased by $13 million, or about 5% (table 1).

In 2006, Minnesota continued to rank first among other producing States in the quantity of iron ore produced and fifth in construction sand and gravel. The State rose in rank to second from third in the production of peat and to sixth from eighth in the production of industrial sand and gravel and it was the producer of significant quantities of crushed stone.

The following narrative information was provided by the Minnesota Department of Natural Resources' (DNR) Division of Lands and Minerals[2] (MDLM). Production data in the following text are those reported by the MDLM, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS. In 2006, mining in Minnesota actively continued in the traditional nonfuel mineral sectors, and a variety of new mineral-related research and mineral exploration activities took place in the State. Identified resources of base metals, construction aggregates, dimension stone, direct-shipping grade iron ore, manganese, peat, and stone (landscaping) allowed for prospective opportunities for new mineral development in the State. Minnesota geologically has potential for the occurrence of such mineral resources as base metals and precious metals, diamond, and kaolin, as well as for oil and gas. The level of investment in mineral exploration activity was significantly higher than in the past few years and many additional mineral development investment opportunities continued to exist in the State.

Exploration and Development Activities

Metallic Mineral Exploration Activities

Exploration Drilling.—Four companies, Duluth Metals Ltd., Franconia Minerals Corp., Kennecott Exploration Co., and Polymet Mining Corp. explored for copper, nickel, and platinum-group metals (PGM) in Minnesota. Duluth Metals and Franconia Minerals were in the midst of drilling programs in the Duluth Complex, while Kennecott Exploration made plans for future drilling in east-central Minnesota, concentrating in the Tamarack area of Aitkin County. Polymet Mining Corp. was in the midst of an environmental review process for a proposed copper-nickel-PGM mine.

Exploration companies completed 119 drill holes under the State's Exploratory Boring law in the biennium (2-year period) ending January 25, 2007, which was about four times that of the previous biennium. There also was a significant increase in the number of State metallic mineral leases awarded since the previous biennium. The DNR performed drill-site inspections to ensure regulatory compliance with exploration laws and rules and compliance with leasing requirements for submission of drilling operation data, the inspections in part assessing the knowledge and compliance by ever-changing company personnel.

Kennecott Exploration, which drilled 19 holes in 2005, completed no drilling in 2006. However, the company did perform a gravity survey and downhole electromagnetic surveys in 2006 in the vicinity of Tamarack, Aitkin County, to identify new target areas to drill in the search for copper-nickel resources. Kennecott focused its efforts west of Cloquet, in the

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Maryanna Harstad, Senior Planner, authored the text of the State mineral industry information provided by the Minnesota Department of Natural Resources' Division of Lands and Minerals.

Tamarack area, where six holes had been drilled and cased to bedrock in preparation for bedrock core drilling. As many as 30 holes were approved in the current plan.

Duluth Metals Ltd. (a subsidiary of Wallbridge Mining Company Ltd.) drilled 11 core holes in Lake County beginning in April 2006. They were drilling out the Maturi Extension, a deep mineralized zone adjacent to the Maturi deposit, which was controlled by Franconia Minerals. Three rigs were drilling on holes 12, 13, and 14. Holes varied from 731 meters (m) (2,400 feet) to nearly 1,220 m (more than 4,000 feet) in depth. A total of nearly 10,400 m (34,031 feet) of core was drilled during the year; 30 holes were planned for this campaign on lands of State leases and Federal leases, and four mineral rights associated with private leases held pursuant to an agreement with RGGS Lands & Minerals Ltd. (Cox and others, 2009).

In June, Franconia Minerals began a $10 million drilling program to obtain bulk samples at the Birch Lake copper-nickel-platinum-palladium deposit. The company drilled five holes (each with 4 wedges) and was working on the sixth hole in its bulk sample drilling phase, a large-diameter core of about 7.6 centimeters (cm) (3 + inches) that was being drilled to obtain a bulk sample for bench-scale metallurgical testing. The holes (excluding hole number 6) ranged from about 700 to 762 m in depth, thus far a total of 5,590 m, including wedges. Franconia planned to send the bulk samples to a Canadian metallurgical laboratory to begin the economic feasibility process.

Franconia also drilled two holes (968 m total for both) just east of LTV Steel Mining Company's former Dunka Mine in March to test mineralization near the contact of the Duluth Complex, but results did not merit further work at the time.

Other Exploration Projects.—608457 B.C. Ltd. performed two episodes of glacial till sampling for gold in the Mud Creek area, between Tower and Ely, in May and September. This sampling consisted of auger or shovel holes about 0.9 meters deep with the samples processed for contained gold grains. This leasing and exploration was a followup to DNR identification of gold-bearing till in that area.

Polymet Mining drilled 51 holes on its Northmet property near Babbitt during the fall of 2005. The NorthMet ore body contains cobalt, copper, gold, nickel, palladium, and platinum, as well traces of zinc and silver. Connected by a private railroad (about 10 kilometers to the west of the Northmet property) was Polymet Mining's Erie Plant, a large crushing and milling facility with extensive associated infrastructure. Polymet acquired the Erie Plant (then operated by Cleveland Cliffs, Inc) from LTV Steel (Polymet Mining Corp., 2008, p. 1–3). The company submitted an operating plan for as many as 103 drill holes on the Northmet property with drilling planned to begin the last week of January 2007. Polymet was also actively engaged in the environmental impact statement process for the project.

The NorthMet ore body is in the center of a trend of polymetallic nonferrous metal deposits on the northwestern contact of the Duluth Complex, an arc-shaped intrusive complex thought to have been emplaced along a system of northeast-trending faults associated with the Midcontinent rift system that underlies Lake Superior.

Encampment Resources L.L.C., which had planned to drill on Federal permits near Spruce Road in Lake County, did not drill because its permits there had been rescinded. The company planned to do some drilling on its other State leases in the winter.

Prime Meridian Resources Corp. had exploration agreements on non-State land minerals in Fillmore County over a buried mafic body that had been drilled some decades previous by New Jersey Zinc Co. The company also had State mineral leases in Koochiching County and Lake of the Woods County, but no activity took place in those areas by yearend.

Teck-Cominco American Corp. submitted an operational plan for drilling on the Babbitt copper-nickel deposit for 2007–2008, but approval of the plan remained pending at yearend.

During the spring, ArcelorMittal USA Inc. (Mittal Steel USA—Minorca Mine, Inc.) drilled 31 holes on its planned new taconite pit at Belgrade, just west of Biwabik.

Commodity Review

Industrial Minerals

The DNR Minerals Coordinating Committee (MCC) sponsored a one-day "Mineral Opportunity Meeting" addressing the topics of construction aggregates and dimension and landscape stone. Constructive dialogue took place between government and industry on associated current issues.

A controversy over the continued operation of a 6-year-old granite construction aggregate quarry in the Minnesota River Valley Scenic River District resulted in the Minnesota DNR Commissioner determining that the quarry was not in compliance with the Scenic River District Rules. The Renville County Board then did not renew the permit to mine for the quarry. The company has not yet complied with the county demands for reclamation for the quarry's closure.

The Minnesota DNR had three planned leases with Cliffs Natural Stone for properties at the former LTV Steel Corp. site. The pre-existing Stockpile lease for flagstone had an increase in royalty rate, with lease status still being processed. There was one new Earthen Material lease for nearly 49 hectares (ha) (120 acres), sent to the lessee for signature, and a second Earthen Material lease for a quarry site still being processed. At least three other companies inquired about access to the former LTV site to quarry dimension stone and take stockpiled stone, but access on a private road to the site, at least in part, was deterring those companies' ability to complete the leasing.

Public Arts St. Paul sponsored a stone sculpture event, in which stone carvers from around the world used large Minnesota quarry stone blocks to create new sculptures for public display. The event drew a large crowd and resulted in good publicity for Minnesota stone products in general. Minnesota DNR assisted by writing technical pieces for print media and doing video clips at the site, and also worked with all the Minnesota quarry stone companies to develop a stone sample display for the entry tent. This concept had been proposed at one of the MCC Mineral Opportunity Meetings.

In the 19th and 20th centuries, the Federal Government had conveyed several land grants of Federal land to Minnesota, as it did to other States (mostly western), to be held in trust for certain purposes. Through the Enabling Act of 1857, sections 16 and 36 were granted to the State for the use of schools—the School Trust Lands for the Permanent School Trust Fund (PSTF). Starting in 1901, Minnesota held mineral rights for the Federal lands then transferred to the State with the designated mineral rights under an act of the U.S. Congress. As of 2007, the State held slightly more than 1 million ha (2.5 million acres) of school trust lands and more than 400,000 ha (about 1 million acres) of severed trust minerals. Historically, minerals management generates the largest net income for the school trust fund with taconite and other iron ore being the leading producers. Other trust fund contributors include leases for peat, sand and gravel, and deposits of copper-nickel-platinum. The land remains available for other public uses, and for use by future generations. Annual income distribution provides for part of the school aid formula for K–12 education in the State. In fiscal year 2006, $22 million was distributed. The ongoing project's goal is to increase revenues generated to the PSTF in accordance with directives in the Minnesota Constitution and Minnesota Statute 127A.31 (entitled, Goal of the Permanent School Fund) by identifying and selling (via lease) sand and gravel or crushed stone, called construction aggregates resources, from Permanent School lands. A cornerstone of this effort is the site-specific evaluations (to identify) of parameters including the areal extent, thickness, quality, volume, access to, and reclamation plan that affect the resource value and site management of construction sand and gravel deposits (Minnesota Department of Natural Resources, Division of Lands and Minerals, 2007, p. 5, 9, 10, 27).

Approximately 40 bedrock outcrop sites were reviewed for the potential to produce high-quality crushed stone aggregate from a PSTF site. In 2006, five sites were selected, sampled and analyzed by a laboratory-screening test. One site, near Finland, was rated as having the best overall potential, based on location and quality, but an October field visit revealed that the county had sold the adjacent tax forfeited property and a new residence was being built very near the common property line. Additionally, the access road to that property was across this PSTF property. This dropped the site from the high ranking and made more necessary work in the year to follow to find a different location to offer for lease.

Metals

Iron Ore.—In 2006, Minnesota's iron ore mining and pellet producing operations for the most part were under the ownership of three main companies, ArcelorMittal, Cleveland-Cliffs Inc, and United States Steel Corp. The three companies employed a total of 3,576 employees. With a total rated capacity of about 41 Mt (40.4 million gross tons) of taconite pellet production, the actual production was approaching 100% at 40.8 Mt in 2006, with increased production expected in 2007 by all companies.

United Taconite, LLC a new taconite company formed in December 2003 [Cleveland-Cliffs Inc (70%) and the Chinese steel company, Laiwu Steel Corp. (30%)] purchased the assets of the former EVTAC Mining Co. United Taconite's mine was located west of and adjacent to Eveleth, MN. Crude ore was mined, crushed, and rail-hauled about 15 kilometers (km) (9 miles) south to its processing plant near Forbes. The processing plant including its 2004 restarted line #1 (previously idled since 1999) was rated at nearly 5.3 million metric tons (Mt) (5.2 million gross tons) of pellets. United Taconite had one State taconite mining lease comprised of nearly 49 ha (120 acres).

Hibbing Taconite Co. (HTC) [ArcelorMittal (62%), Cliffs Mining Co. (23%), and Stelco Inc. (15%)] had mining (four separate pits) and plant operations located about 5 km north of Hibbing. HTC, which employs autogenous grinding in its primary mill circuits, was the first North American pellet producer to install tower mills/verti-mills for fine grinding and improved liberation. The HTC plant was rated at 8.3 Mt of pellets. HTC had 10 State mining leases comprising about 208 ha.

At the Minorca Mine (a wholly owned subsidiary of ArcelorMittal) mining took place at the Laurentian Pit located about 1.5 km northeast of Gilbert; the company moved crude ore via haul trucks about 10 km to the Minorca plant about 3 km northeast of Virginia, MN, for processing. The plant was rated at more than 2.6 Mt of pellets. Minorca had no State mining leases.

U.S. Steel—Keewatin Taconite (formerly National Steel Pellet Co.) has operated its Keewatin facility under the company's Minnesota Ore Operations since May 2003. Keewatin Taconite's mine and plant facilities, located about 1.5 km north of Keewatin, was the only active taconite mining operation in Itasca County. The plant was rated at 5.6 Mt of pellets and the company held 5 State mining leases totaling 178 ha.

Northshore Mining Company, owned by Cliffs Minnesota Minerals Co. (a wholly owned subsidiary of Cleveland-Cliffs Inc), operated a mine 8 km southeast of Babbitt. The company's plant in Silver Bay was rated at 4.9 Mt of taconite pellets. Northshore held three State taconite leases totaling 162 ha.

U.S. Steel—Minnesota Ore Operations' Minntac Mine and plant facilities, located about 1.5 km north of Mountain Iron, was the largest taconite mine and plant in North America, its pit extending 16 km in length and its plant was rated at a capacity of about 15.6 Mt of pellets. U.S. Steel held 38 State taconite leases totaling nearly 1,100 ha.

Government Programs

Minnesota Minerals Research Programs

The Iron Ore Cooperative Research Program, previously created by the Minnesota Legislature, was used to assist the Minnesota taconite industry by providing funds for taconite research projects. The program was appropriated $550,000 for fiscal years 2006–2007 to be matched by $275,000 of taconite company money. A committee consisting of Minnesota taconite-company metallurgists, research scientists, and Minnesota DNR engineers determined the research priorities. The funded research projects were usually performed in Minnesota research laboratories and pilot-plant facilities. The program was considered very successful with many of the funded research projects being instituted at the taconite facilities resulting in improved product quality and reduced production costs.

The State's Mineral Coordinating Committee was established by the Minnesota Legislature as part of the minerals diversification plan. The committee was apportioned $344,000 for fiscal years 2006–2007 for funding mineral research projects. The goal is to fund research projects that increase knowledge of the State's mineral potential, stimulate the development of mineral resources in the State, and promote basic mineral research. The programs success resulted in increased interest in exploration and development of Minnesota's copper-nickel resources by mining companies such as Franconia Minerals Corp., Polymet Mining Co., and Teck-Cominco Ltd. Funding from this program was also used to identify Minnesota aggregate resources, which aided county planning agencies in determining zoning regulations.

The Minnesota Legislature created the Permanent University Trust Fund to be used for Minnesota taconite and mineral research. The fund was formed using mining royalities paid by companies that mine on University Trust Land. In 2006, the total amount in the fund was about $30 million, which is allowed to increase to as high as $50 million. Each year the interest from the fund is used to provide grants to perform taconite and minerals research at the University of Minnesota's Coleraine Minerals Research Laboratory. Disbursements from the fund for research during FY 2006 were about $1.2 million. Several successful projects developed at the Coleraine Laboratory have been installed at Minnesota taconite facilities.

The DNR's Mineral Management Initiative Fund (the 420 Fund) was established to help maintain and increase income from the mining of State-owned mineral deposits. Projects have involved: 1) examination of selected bedrock drill core for clues to deposits of diamonds, gold, platinum, or other metals; 2) compilation of mineral data including dimension stone, ilmenite, landscape stone, and iron ore for a number of Minnesota sites; 3) performing mineral ownership title work that focuses on priority areas on the Mesabi Range and other areas of the State that have nonferrous metallic mineral potential; 4) coordinating and conducting research to help the taconite companies find ways to reduce mercury emissions; and 5) assisting in conducting baseline research and environmental review for new mineral projects.

Environmental and Technological Research.—The Minnesota Legislature established a Cooperative Research Fund to address environmental issues resulting from mining. The fund is administered by the DNR and was appropriated $173,000 for fiscal years 2006–2007. Research or demonstration projects are done in each of the State's mining sectors (ferrous, industrial mineral, and nonferrous), and projects require a 50% match by non-State monies. The overall goal of the programs is to develop and demonstrate new and cost-efficient reclamation techniques applicable to the State's mining industry. Results and techniques developed from this program have been implemented by the mining industry to address reclamation procedures, mine development and closure, and the control of environmental impacts.

In addition to DNR's Web site entitled, Public Access to Minerals Data, at URL http://minarchive.dnr.state.mn.us, aggregate resource maps, monthly data releases, and many online documents pertaining to mineral and mining research and exploration in Minnesota are available on the State agency's home page at www.dnr.state.mn.us.

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	20	22	20	22	32	40
Gemstones, natural	NA	6	NA	6	NA	6
Iron ore, usable shipped	41,400	1,560,000	40,600	1,830,000	40,400	2,160,000
Lime	W	(3)	W	(3)	W	(3)
Peat	63	5,210	68	5,670	69	5,280
Sand and gravel:						
Construction	54,900	235,000	54,100	253,000	50,300	240,000
Industrial	W	(3)	W	(3)	W	(3)
Stone:						
Crushed	10,400 [4]	64,900 [4]	10,500	87,400 [r]	12,400	121,000
Dimension	22	12,400	19	13,400	22	12,400
Total	XX	1,880,000	XX	2,190,000	XX	2,540,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

[4] Excludes certain stones; value excluded to avoid disclosing company proprietary data.

TABLE 2

MINNESOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	38 [r]	3,540 [r]	$28,600 [r]	39	4,860	$46,800
Granite	4	2,690	23,000 [r]	5	3,180	30,700
Dolomite	7 [r]	3,900 [r]	32,400 [r]	6	4,000	40,000
Quartzite	1	315 [r]	3,200 [r]	1	310	3,150
Miscellaneous stone	1	22	207	1	52	529
Total	XX	10,500	87,400 [r]	XX	12,400	121,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	131	2,630
Filter stone	W	W
Other coarse aggregate	47	894
Total	208	3,810
Coarse aggregate, graded:		
Concrete aggregate, coarse	631	5,770
Bituminous aggregate, coarse	193	2,840
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	623	5,150
Other graded coarse aggregate	221	2,850
Total	1,670	16,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	310	2,640
Screening, undesignated	W	W
Other fine aggregate	87	1,500
Total	453	4,590
Coarse and fine aggregates:		
Graded road base or subbase	1,280	13,000
Unpaved road surfacing	(3)	(3)
Crusher run or fill or waste	64	607
Other coarse and fine aggregates	70	266
Total	1,410	13,900
Other construction materials	8	108
Agricultural:		
Limestone	(4)	(4)
Poultry grit and mineral food	(5)	(5)
Other miscellaneous uses and specified uses not listed	(5)	(5)
Unspecified:[6]		
Reported	3,100	26,300
Estimated	5,500	56,000
Total	8,650	81,900
Grand total	12,400	121,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[3] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[5] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6] Reported and estimated production without a breakdown by end use.

TABLE 4
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 2		Districts 3 and 4[3]		Districts 5 and 6[3]		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[4]	--	--	93	1,600	115	2,210	--	--
Coarse aggregate, graded[5]	--	--	1,510	14,000	158	2,560	--	--
Fine aggregate (-⅜ inch)[6]	--	--	350	2,980	103	1,610	--	--
Coarse and fine aggregates[7]	--	--	354	3,040	1,060	10,800	--	--
Other construction materials	--	--	8	108	--	--	--	--
Agricultural[8]	--	--	W	W	(9)	(9)	--	--
Other miscellaneous uses and specified uses not listed	--	--	W	W	--	--	--	--
Unspecified:[10]								
Reported	--	--	1,790	17,800	618	5,960	696	2,500
Estimated	3	25	390	4,000	5,200	52,000	--	--
Total	3	25	4,500	43,800	7,200	74,800	696	2,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 1.

[3] Districts 3 and 4 and 5 and 6 are combined to avoid disclosing company proprietary data.

[4] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[5] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[6] Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[7] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[8] Includes agricultural limestone and poultry grit and mineral food.

[9] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,440	$30,400	$5.58
Plaster and gunite sands	72	596	8.28
Concrete products (blocks, bricks, pipe, decorative, etc.)	176	2,020	11.47
Asphaltic concrete aggregates and other bituminous mixtures	5,580	32,700	5.85
Road base and coverings[2]	13,800	44,700	3.23
Fill	2,870	8,300	2.89
Snow and ice control	129	472	3.66
Railroad ballast	29	243	8.38
Roofing granules	14	124	8.86
Other miscellaneous uses[3]	126	1,260	10.00
Unspecified:[4]			
Reported	3,090	14,200	4.58
Estimated	18,900	105,000	5.55
Total or average	50,300	240,000	4.77

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (cement and lime).

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,020	7,260	949	4,190	440	2,440
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	1,720	9,110
Road base and coverings[3]	2,680	9,410	1,100	3,860	3,660	11,100
Fill	432	926	213	471	840	2,100
Snow and ice control	W	W	W	W	18	94
Railroad ballast	--	--	--	--	29	243
Roofing granules	--	--	--	--	14	124
Other miscellaneous uses[4]	371	1,820	198	641	59	568
Unspecified:[5]						
Reported	--	--	432	903	21	75
Estimated	2,830	13,100	1,710	7,960	3,970	21,100
Total	7,320	32,500	4,600	18,000	10,800	46,900

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	738	4,570	582	3,630	372	2,550
Asphaltic concrete aggregates and other bituminous mixtures	324	4,730	W	W	W	W
Road base and coverings[3]	775	2,770	604	2,930	272	1,150
Fill	204	574	940	3,270	230	951
Snow and ice control	11	45	W	W	28	63
Railroad ballast	--	--	--	--	--	--
Roofing granules	--	--	--	--	--	--
Other miscellaneous uses[4]	20	243	577	5,190	132	902
Unspecified:[5]						
Reported	642	3,180	471	2,330	1,530	7,680
Estimated	1,170	5,400	7,030	46,000	2,200	11,400
Total	3,880	21,500	10,200	63,400	4,760	24,700

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	1,590	8,370
Asphaltic concrete aggregates and other bituminous mixtures	2,350	10,900
Road base and coverings[3]	4,750	13,500
Fill	13	15
Snow and ice control	27	47
Railroad ballast	--	--
Roofing granules	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	--	--
Estimated	--	--
Total	8,730	32,900

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

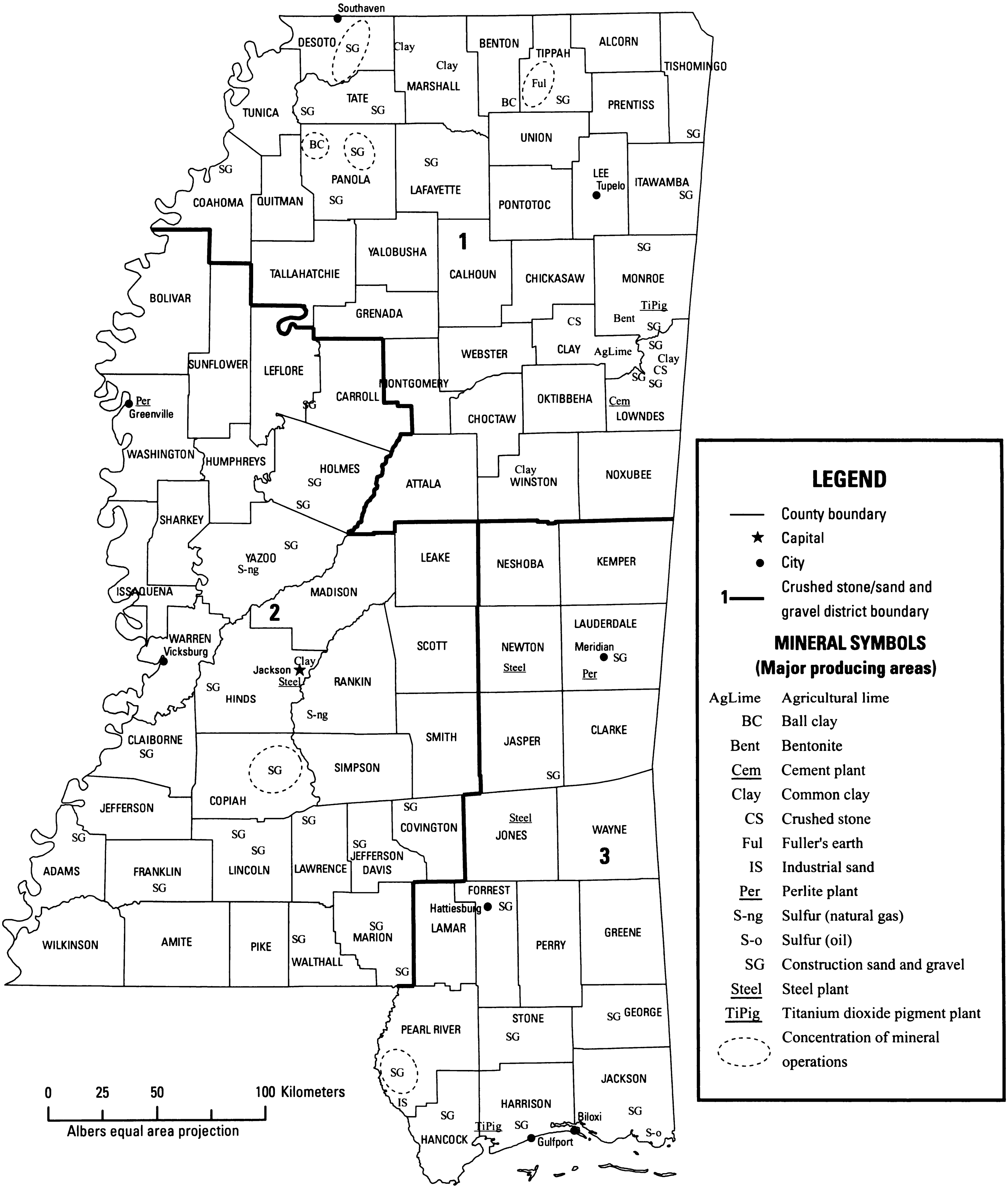
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes filtration.

[5] Reported and estimated production without a breakdown by end use.

MISSISSIPPI



Source: Mississippi Department of Environmental Quality/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MISSISSIPPI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Mississippi Department of Environmental Quality, Office of Geology for collecting information on all nonfuel minerals.

In 2006, Mississippi's nonfuel raw mineral production[1] was valued at $270 million, based upon annual U.S. Geological Survey (USGS) data. This was up by $49 million, or up 22%, from the State's total nonfuel mineral value for 2005 of $221 million, which followed a nearly 14% increase from 2004 to 2005.

Construction sand and gravel was Mississippi's leading nonfuel mineral, accounting for 49% of the State's total nonfuel mineral production value in 2006, up from 39% of the State's total in 2005. When combined with the value of crushed stone, the State's two major mined construction materials accounted for 69% of Mississippi's total nonfuel mineral value.

In 2006, in descending order of value, construction sand and gravel was followed by crushed stone, portland cement, fuller's earth, ball clay, and bentonite (in contrast to 2002–04 when fuller's earth was the State's second-leading nonfuel mineral by value). A substantial increase in the production and value of construction sand and gravel led the State's increase in value in 2006. A 34% increase of 4.9 million metric tons contributed to a $48 million, or 56%, increase in the commodity's total value for the year. Although crushed stone production decreased by about 13%, a substantial increase in its unit value led to an 11%, or $5 million, rise in its value. A smaller yet significant increase took place in the value of ball clay (table 1). The only decreases in value took place in the commodities of bentonite clay and portland cement.

In 2006, Mississippi continued to be third in the quantities of ball clay and fuller's earth clay that were produced as compared with other producing States and decreased to fourth from second in the production of bentonite clay. Additionally, the State continued to be a significant producer of construction sand and gravel and common clays. Metals that were produced, especially raw steel, were processed from materials received from other domestic and foreign sources.

The following narrative information was provided by the Mississippi Department of Environmental Quality's (DEQ) Office of Geology[2] (MOG). The Mississippi DEQ issued 41 surface mining permits for industrial mineral operations covering approximately 405 hectares (ha) (1,000 acres) and processed 74 Notices of Exempt Operations [1.6 ha (4 acres) or less] covering approximately 117 ha (290 acres). Under State law, surface mines of 1.6 ha or less were not required either to obtain a mining permit or to perform reclamation of any kind. The MOG's Mining and Reclamation Division (MRD) performed 924 annual inspections for all active mining permits on file and received applications for bond release on 50 permits. During the year, a total of 350 ha (864 acres) were reclaimed and released.

All mines in Mississippi were surface industrial mineral operations except one, the State's only coal (lignite) mine. Mississippi Lignite Mining Company in Choctaw County, continued to mine and stockpile lignite, mining the lignite from the Wilcox Group formation. The brownish black coal material was mined for feed to the 440-megawatt Red Hills mine-mouth powerplant that uses state-of-the-art technology to produce electricity that is sold to the Tennessee Valley Authority. In 2005, a proposal by the company to use coal ash on roads and ramps in the mine had been approved by the Mississippi Department of Environmental Quality, Office of Pollution Control.

Commodity Review

Industrial Minerals

The mining of nonfuel minerals in Mississippi, mainly for sand and gravel, continued to be very active mainly because of the ongoing rebuilding of the Gulf Coast after Hurricane Katrina in 2005. Much of the material being used to rebuild the levees in New Orleans was mined from south Mississippi clay sand mines. The demand for materials for use in building new roads, houses, and other structures was very high. The demand for sand and gravel was also very high in other parts of the State, such as the northwest counties south of Memphis, TN.

Clay.—Ball clay and fuller's earth clay continued to be mined in the northern counties of the State, and common clay, mainly for the production of bricks, was still being mined in various areas in the State, mainly in central and north central counties. The bentonite clay mines in Monroe County that had been idle since their closure in 2005 continued to be idle but plans were being formulated for the formation of a new company that would start these mines back up possibly in 2007 or 2008. BASF Catalysts LLC, which had several permits to mine bentonite in Monroe County, reduced personnel but continued to operate mines in that area.

Government Programs

The MRD completed a mining database for all mining sites in the State by electronically recording all permitted and exempt [1.6 ha (4 acres) or less] sites into an ArcGIS™ format. Paper maps had been in use since 1978; when fully operational, use of the database via the Internet will allow the public to access the data on the MRD Web site.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Kenneth McCarley, Geologist and Director, Mining and Reclamation Division, Mississippi Office of Geology, authored the text of the State mineral industry information provided by that agency.

The MRD continued to perform safety training for miners and certain other personnel at the State's mining and mineral processing operations in compliance with the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) regulations, in particular under Part 46 (sand and gravel) and Part 48 (coal or lignite) of the MSHA regulations. Three people on the Mining and Reclamation staff were certified by MSHA to do mine safety training. A grant from MSHA helps the MRD provide training for operations that process material, such as rock crushing or washing operations. The staff trained 520 miners and contractors in 2006.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MISSISSIPPI[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	W	W	78	5,180
Common	610	2,700	642	2,860	549	3,100
Fuller's earth	381	35,200	354	33,000	338	33,600
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel, construction	14,100	80,700	14,400	85,200	19,300	133,000
Stone, crushed	2,760	34,200	3,520 [r]	47,800 [r]	3,050	53,000
Combined values of cement (portland), clays (ball), sand and gravel (industrial)	XX	41,500	XX	52,000	XX	42,400
Total	XX	194,000	XX	221,000 [r]	XX	270,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

MISSISSIPPI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	4	3,520 [r]	$47,800 [r]	3	3,050	$53,000

[r] Revised.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), other	W	W
Coarse aggregate, graded:		
Railroad ballast	W	W
Other graded coarse aggregate	W	W
Fine aggregate (-⅜ inch), other	W	W
Coarse and fine aggregates, other	W	W
Agricultural, limestone	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Sulfur oxide removal	W	W
Unspecified:[2]		
Reported	886	17,600
Estimated	27	320
Total	913	17,900
Grand total	3,050	53,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4

MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	W	W
Coarse aggregate, graded[3]	W	W	--	--	W	W
Fine aggregate (-⅜ inch)[4]	W	W	--	--	W	W
Coarse and fine aggregate[5]	W	W	--	--	W	W
Agricultural[6]	W	W	--	--	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Unspecified:[8]						
Reported	391	7,770	495	9,820	--	--
Estimated	27	320	--	--	--	--
Total	1,620	22,700	495	9,820	933	20,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes other coarse aggregate.

[3] Includes railroad ballast and other graded coarse aggregate.

[4] Includes other fine aggregate.

[5] Includes other coarse and fine aggregates.

[6] Includes agricultural limestone.

[7] Includes cement manufacture and sulfur oxide removal.

[8] Reported and estimated production without a breakdown by end use.

TABLE 5
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,340	$31,500	$7.27
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	138	1,120	8.09
Asphaltic concrete aggregates and other bituminous mixtures	1,350	9,960	7.37
Road base and coverings[3]	734	3,990	5.43
Fill	196	491	2.51
Unspecified:[4]			
Reported	5,970	40,400	6.76
Estimated	6,540	45,000	6.89
Total or average	19,300	133,000	6.88

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,430	8,610	1,890	15,300	909	7,170	246	1,620
Asphaltic concrete aggregates and road base materials[3]	859	5,240	1,140	8,100	45	396	38	209
Fill	113	264	7	17	60	168	17	42
Unspecified:[4]								
Reported	2,800	19,000	48	205	3,120	21,200	--	--
Estimated	1,280	8,800	2,800	19,300	2,450	16,900	--	--
Total	6,490	41,900	5,890	42,900	6,590	45,800	301	1,880

-- Zero.

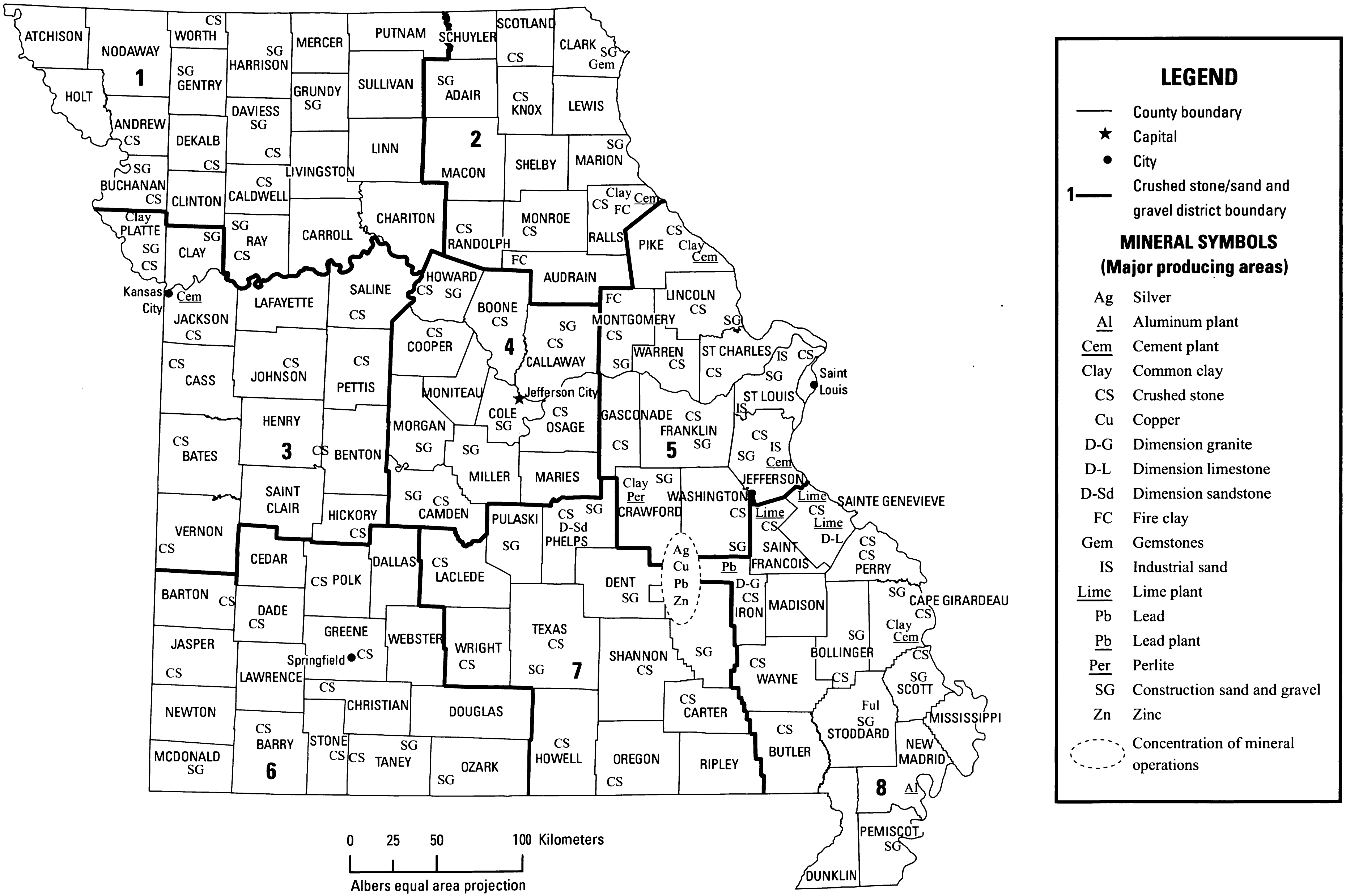
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Reported and estimated production without a breakdown by end use.

MISSOURI



Source: Missouri Department of Natural resources, Division of Geology and Land Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MISSOURI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Division of Geology and Land Survey, for collecting information on all nonfuel minerals.

In 2006, Missouri's nonfuel raw mineral production[1] was valued at $2.07 billion, based upon annual U.S. Geological Survey (USGS) data. This was a more than an 11% increase from the State's total nonfuel mineral production value of $1.86 billion[2] for 2005, which followed a nearly 15% ($240 million) increase from 2004 to 2005.

The State was ranked 10th (8th in 2005) among the 50 States in total nonfuel mineral production value and accounted for more than 3% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for nearly 84% of Missouri's total nonfuel mineral production value in 2006, down from 89% in 2005. This relative decrease resulted from an increase in the value of zinc production, the State's fifth leading nonfuel mineral commodity. The value of zinc rose substantially, owing to a significant increase in the commodity's unit value and a modest increase in production.

Missouri continued to be the top lead-producing State in the Nation, producing more than one-half of the Nation's output in 2006. However, by value, crushed stone and cement remained the State's leading nonfuel mineral commodities, having surpassed lead in 1997 and 1999, respectively. From 1969 to 1996, lead had been Missouri's leading nonfuel mineral, except for several years in the mid-1980s and 1993–95, when crushed stone was ranked first.

In 2006, in descending order of change, increases in the values of zinc, lead, portland cement, construction sand and gravel, copper, and lime led Missouri's increase in total nonfuel mineral production value for the year. The total values of lead and zinc production each rose by more than $50 million, while those of portland cement and construction sand and gravel increased by $36 million and nearly $31 million, respectively. The values of copper and lime each rose by more than $15 million, even as smaller yet significant increases also took place in the values of fuller's earth, masonry cement, and industrial sand and gravel. The unit values of each also increased, those of zinc, copper, and lead being the largest by percentage of increase (table 1). The largest decreases in production value took place in crushed stone, down $16 million, as well as a smaller decrease in silver (company proprietary data).

In 2006, Missouri continued to be first in the production of lead and lime, first of six fire clay-producing States, second in fuller's earth, and sixth in the production of portland cement. The State rose to second from third in the production of zinc, but decreased to fifth from fourth in crushed stone. Additionally, Missouri was a significant producer of construction sand and gravel, masonry cement, industrial sand and gravel, and common clays.

The Missouri Department of Natural Resources, Division of Geology and Land Survey[3] (DGLS), provided the following narrative information. Some data or information as reported by the DGLS may differ from USGS estimates and production figures.

Commodity Review

Industrial Minerals

Cement.—Portland cement accounted for most of the State's cement production during the year. Five plants continued to operate with one producing some masonry cement. Total cement produced in 2006 was slightly less than that produced in 2005. Buzzi Unicem USA Inc. operated the Selma and the Cape Girardeau plants, Continental Cement Co. LLC operated the Hannibal plant, and Holcim (US) Inc. operated the Clarksville plant located along the Mississippi River. La North America Inc. operated the Sugar Creek plant along the Missouri River.

Holcim began preconstruction development of its new Lee Island cement production facility, which was to be located between Buzzi's Selma and Cape Girardeau plants in Ste. Genevieve County. Construction of the facility, with an annual production capacity of 4 million metric tons (Mt), was expected to begin in 2007.

Clay.—Common clay and fire clay production totaled about 1.1 Mt in 2006. Production of common clay was down about 9% compared with that of 2005. In addition to the common and fire clays, fuller's earth (also called absorbent clay) was produced during the year. Common clay and fire clay mineral production value accounted for about 0.6% of the total value of nonfuel mineral production in 2006.

Lime.—Quick and hydrated lime production during 2006 was equivalent to that produced in 2005. Chemical Lime Co. and Mississippi Lime Co. operated plants in Ste. Genevieve County near the Mississippi River in southeastern Missouri. Total value of the produced lime increased by about $17 compared with that of 2005. Lime accounted for about 10% of the total value of nonfuel mineral production, virtually unchanged from that of 2005.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] This figure is a revision to the previously published $1.94 billion in the The Mineral Industry of Missouri chapter in the U.S. Geological Survey Minerals Yearbook, Area Reports: Domestic 2005 Volume II; the value of crushed stone has been revised to $647 million from $733 million published there, resulting from a revision in the quantity produced to 87.4 million metric tons (Mt) from 99.4 Mt (table 1).

[3] Patrick S. Mulvany, Geologist and Chief, Industrial Minerals Unit, authored the text of the State mineral industry information provided by the Missouri Department of Natural Resources, Division of Geology and Land Survey, Geologic Resources Section.

Sand and Gravel, Construction.—Construction sand and gravel production was about 17 Mt in 2006, up from about 12 Mt in 2005. Total value was about $92 million, up from about $62 million in 2005. Construction sand and gravel accounted for about 4.4% of the total value of nonfuel mineral production, up from about 3.3% in 2005.

Sand and Gravel, Industrial.—High-purity quartz (silica) sand production was about 0.59 Mt, slightly up from about 0.56 Mt in 2005. The sand was mined from the Ordovician St. Peter Sandstone in St. Louis and Jefferson Counties by Unimin Corp. and U.S. Silica Co. Total value of the sand was about $16 million, up from about $14 million in 2005. Industrial (silica) sand accounted for about 0.8% of the total value of nonfuel mineral production, unchanged from 2005.

Stone, Crushed.—Crushed stone production was about 84 Mt, down from about 87 Mt in 2005. Most (about 98%) was limestone and dolomite. The remainder consisted of granite and rhyolite (trap rock). Total value of the stone was about $631 million, slightly down from about $647 million in 2005. Crushed stone accounted for 30.5% of the total value of nonfuel mineral production, down from 34.8% in 2005.

Stone, Dimension.—Dimension stone production in the form of granite, limestone and dolomite, and sandstone was about 0.003 Mt, virtually unchanged from that of 2005. Dimension stone accounted for about 0.03% of the total value of nonfuel mineral production.

Metals

Copper, Lead, Silver, and Zinc.—All production of these metals came from The Doe Run Resources Corp. underground mines in the Viburnum Trend on the west side of the St. Francois Mountains in southeastern Missouri. Total production was about 0.29 Mt, of which lead accounted for about 88%. Total value of the metals produced was about $566 million, which accounted for about 27% of the total value of nonfuel mineral production.

Doe Run's Herculaneum smelter continued to operate, but its Glover smelter remained on care-and-maintenance status. The Doe Run Buick Resource Recycling Division continued to operate its lead recycling plant near the town of Boss.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MISSOURI[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	5,260	388,000 [e]	5,330	464,000 [e]	5,240	500,000 [e]
Clays:						
Common	911	3,290	822	3,400	750	4,160
Fire	W	W	W	W	359	7,600
Sand and gravel:						
Construction	12,200	60,100 [r]	12,200	61,600	17,000	92,100
Industrial	589	14,200	559	14,500	595	16,400
Stone, crushed	92,600	564,000	87,400 [r]	647,000 [r]	83,600	631,000
Combined values of cadmium (byproduct of zinc concentrates),[3] cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	593,000	XX	666,000	XX	818,000
Total	XX	1,620,000	XX	1,860,000 [r]	XX	2,070,000

[e] Estimated. [r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Data not available for 2006.

TABLE 2
MISSOURI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone[2]	164 r	81,400 r	$536,000 r	159	77,200	$523,000
Dolomite	18	3,860	26,400	16	3,590	25,100
Granite	2	W	W	2	W	W
Traprock	1	W	W	1	W	W
Sandstone	--	--	--	1	121	372
Miscellaneous stone	--	--	--	1	83	647
Total	XX	87,400 r	647,000 r	XX	83,600	631,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	3,170	13,600
Filter stone	577	4,540
Other coarse aggregate	1,090	7,680
Total	4,840	25,800
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,230	25,400
Bituminous aggregate, coarse	1,540	10,200
Bituminous surface-treatment aggregate	128	845
Railroad ballast	1,450	7,790
Other graded coarse aggregate	3,740	27,900
Total	10,100	72,100
Fine aggregate (-⅜ inch):		
Stone sand, concrete	330	2,860
Stone sand, bituminous mix or seal	492	3,340
Screening, undesignated	920	2,840
Other fine aggregate	424	2,840
Total	2,170	11,900
Coarse and fine aggregates:		
Graded road base or subbase	4,230	21,200
Unpaved road surfacing	1,250	6,580
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	707	4,160
Roofing granules	(2)	(2)
Other coarse and fine aggregates	4,740	25,900
Total	11,400	127,000
Other construction materials[3]	457	3,940
Agricultural, limestone	(4)	(4)
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Lime manufacture	(4)	(4)
Dead-burned dolomite manufacture	(4)	(4)
Special, asphalt fillers or extenders	(4)	(4)
Unspecified:[5]		
Reported	9,800	75,700
Estimated	37,000	280,000
Total	46,500	358,000
Grand total	83,600	631,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Includes pipe bedding.

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	Districts 1 and 3[2]		Districts 2 and 5[2]		Districts 4 and 7[2]		District 6		District 8	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[3]	91	484	1,430	10,100	203	1,490	W	W	W	W
Coarse aggregate, graded[4]	758	5,840	3,230	23,900	1,140	8,380	1,600	12,900	3,350	21,200
Fine aggregate (-⅜ inch)[5]	195	644	1,290	6,900	18	56	584	3,840	76	448
Coarse and fine aggregates[6]	369	2,420	4,740	25,400	1,260	6,600	1,250	7,450	3,810	85,300
Other construction materials[7]	--	--	420	3,650	13	78	24	205	--	--
Agricultural[8]	52	341	W	W	54	219	W	W	W	W
Chemical and metallurgical[9]	5	21	W	W	--	--	--	--	W	W
Special[10]	--	--	--	--	--	--	--	--	W	W
Unspecified:[11]										
Reported	5,630	43,400	1,610	12,400	990	7,660	1,040	8,030	535	4,150
Estimated	7,400	57,000	7,200	55,000	2,800	21,000	6,400	50,000	13,000	100,000
Total	14,500	110,000	23,800	149,000	6,430	45,800	11,200	83,900	27,700	242,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 3, 2 and 5, 4 and 7 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[4] Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes pipe bedding.

[8] Includes agricultural limestone.

[9] Includes cement and lime manufacture and dead-burned dolomite manufacture.

[10] Includes asphalt fillers or extenders.

[11] Reported and estimated production without a breakdown by end use.

TABLE 5
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,460	$31,300	$5.74
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	1,880	7,100	3.78
Asphaltic concrete aggregates and other bituminous mixtures	356	2,330	6.54
Road base and coverings[3]	255	1,290	5.04
Fill	296	2,080	7.04
Snow and ice control	19	110	5.79
Other miscellaneous uses[4]	601	3,620	6.03
Unspecified:[5]			
Reported	2,710	15,600	5.78
Estimated	5,410	28,600	5.29
Total or average	17,000	92,100	5.43

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (lime).

[4] Includes railroad ballast and golf course.

[5] Reported and estimated production without a breakdown by end use.

TABLE 6

MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	W	W	--	--
Asphaltic concrete aggregates and road base materials[3]	W	W	W	W	--	--
Fill	W	W	W	W	--	--
Other miscellaneous uses[4]	W	W	--	--	--	--
Unspecified:[5]						
Reported	1,650	9,110	44	269	(6)	(6)
Estimated	436	2,310	151	798	2,370	12,500
Total	2,920	16,200	251	1,330	2,370	12,500

	District 4		District 5		District 6	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	965	5,050	4,970	25,500	W	W
Asphaltic concrete aggregates and road base materials[3]	W	W	W	W	--	--
Fill	W	W	188	1,670	--	--
Other miscellaneous uses[4]	W	W	348	3,220	W	W
Unspecified:[5]						
Reported	897	5,080	105	1,080	10	110
Estimated	67	352	2,000	10,600	150	794
Total	2,760	15,200	7,320	39,300	166	982

	District 7		District 8		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	154	996	W	W	83	351
Asphaltic concrete aggregates and road base materials[3]	71	434	W	W	--	--
Fill	21	87	--	--	--	--
Other miscellaneous uses[4]	7	48	--	--	--	--
Unspecified:[5]						
Reported	--	--	--	--	--	--
Estimated	233	1,230	--	--	--	--
Total	485	2,790	618	3,270	83	351

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

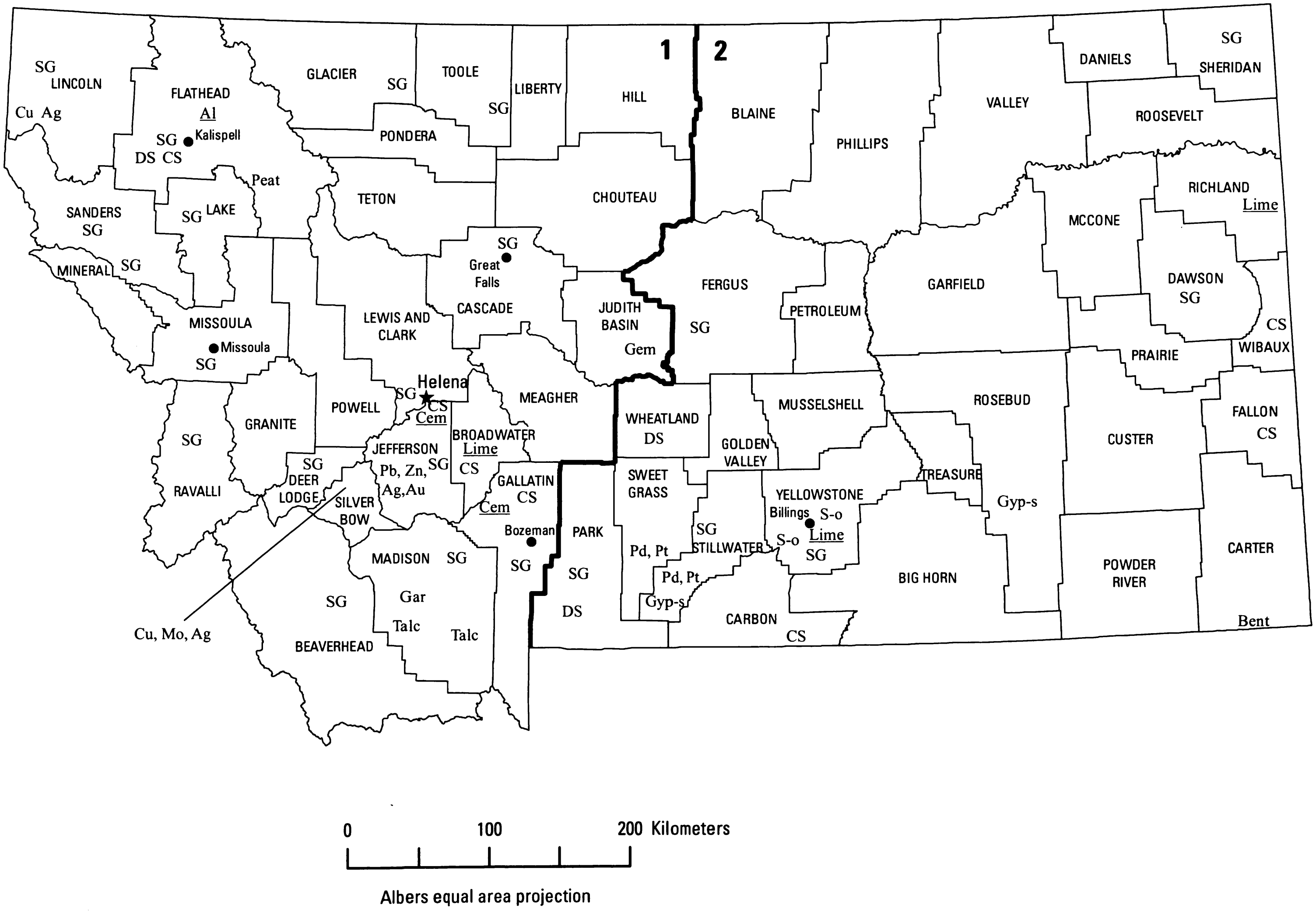
[3] Includes road and other stabilization (lime).

[4] Includes golf course, railroad ballast, and snow and ice control.

[5] Reported and estimated production without a breakdown by end use.

[6] Less than ½ unit.

MONTANA



LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Al	Aluminum plant
Au	Gold
Bent	Bentonite
Cem	Cement plant
CS	Crushed stone
Cu	Copper
DS	Dimension stone
Gar	Garnet
Gem	Gemstones
Gyp-s	Synthetic gypsum
Lime	Lime plant
Mo	Molybdenum
Pb	Lead
Pd	Palladium
Peat	Peat
Pt	Platinum
S-o	Sulfur (oil)
SG	Construction sand and gravel
Talc	Talc
Zn	Zinc

Source: Montana Bureau of Mines and Geology/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2006, Montana's nonfuel raw mineral production[1] was valued at $1.07 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $223 million, or more than 26%, from the value of 2005, which in turn was up $226 million, or up nearly 36%, from that of 2004. The State rose in rank to 21st from 24th among the 50 States in nonfuel raw mineral production value and accounted for about 1.6% of the U.S. total. Yet, per capita, the State ranked 5th in the Nation in the value of its nonfuel mineral production; with a population of about 945,000, the value of production was nearly $1,130 per capita.

Metallic minerals accounted for nearly 79% of Montana's total nonfuel mineral production value in 2006. Copper, molybdenum concentrates, platinum, and palladium were, in descending order of value, the State's leading nonfuel minerals, followed by construction sand and gravel, cement (portland and masonry), and gold, the combined total of which accounted for more than 92% of the State's total nonfuel mineral value, up from 89% in 2005. In 2006, increases in the mineral production values of copper, palladium, and platinum led Montana's increase in value with increases of more than $100 million, about $63 million, and more than $45 million, respectively (table 1); the unit values of each also rose significantly. Smaller yet significant increases took place, in descending order of change, in the values of construction sand and gravel (up by $11.7 million), cement, gold, lime, crushed stone (up by $2.6 million), silver, and crude talc. The unit values of each also showed significant increases, except that of lime which was down by 6%. The largest decrease in mineral production value from 2005 to 2006 took place in molybdenum concentrates, zinc, and lead, down more than $15 million, more than $10 million, and more than $5 million, respectively. Although small in comparison to most of the State's other mineral commodities, the value of gemstones also significantly decreased, down more than 40% (table 1). Several mines, including one of the State's major sapphire mines, closed in 2006.

In 2006, Montana continued to be the only State to have primary palladium and platinum mine production. It also continued to be first in the quantity of talc produced, third of three industrial garnet-producing States, and fifth in copper, molybdenum concentrates, gold, and silver (listed in descending order of production value). The State rose in rank to second from third in bentonite, decreased to eighth from sixth in gemstones (based upon value), and remained a significant producer of construction sand and gravel.

The Montana Bureau of Mines and Geology[2] (MBMG) provided the narrative information that follows. Production and other data in the following text are those reported by the MBMG, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS.

Exploration and Development

Southwest of Superior and St. Regis, Golden Eagle Mining continued a mapping and sampling program in the Superior Gold Belt. Results of soil sampling along mineralized areas indicated gold contents between 300 parts per billion (ppb) and 500 ppb. The company hoped to expand its exploration efforts into trenching and drilling programs during 2007.

Kennecott Exploration Company, Salt Lake City, UT, completed a survey of its Copper Cliff property near Clinton using induced polarization (IP) and resistivity geophysical exploration methods. Survey results indicated that a good target depth for initial drilling was about 300 meters (m). A diamond drilling test completed to a depth of 550 m revealed favorable copper mineralization. Kennecott planned to continue its drilling program into 2007.

O.T. Mining Corporation, Montreal, Quebec, Canada, continued to explore for Butte-type porphyry copper mineralization at the company's Ruby property, north of Butte. Further IP and resistivity geophysical exploration identified several sulfide targets at a depth of 335 m beneath the Lowland Creek volcanics. O.T. Mining planned to drill 18 diamond-drill holes on these North Anomaly area targets in 2007. Drilling in this area had been delayed several years as a result of legal appeals by environmental groups to halt such drilling. Limited exploration drilling just south of the northernmost identified targets revealed subeconomic mineralization.

Exploration drilling by O.T. Mining for precious metals in the southern area of the Ruby property revealed chloritic alteration and disseminated pyrite/chalcopyrite veinlets. The company interpreted this intercept as the fringe of a copper-molybdenum system rather than an epithermal precious metal system.

Near Silver Star, Coronado Resources Ltd., Vancouver, British Columbia, Canada, completed drilling an additional eight holes on its Madison copper-gold project. This drill program augmented previous extensive drilling by other companies as well as Coronado's program which was conducted in 2005. A report commissioned by the company verified the existence of four skarn zones and a massive sulfide zone. The company contracted with Blue Range Engineering Company Inc. of Butte to drive a 213-m decline at a 15% grade into the zones to facilitate further definition drilling (Coronado Resources Ltd., 2006). A permit was secured to allow water to be pumped from the original mine workings at the Madison site, thereby enabling Coronado to develop areas below the water table.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Robin B. McCulloch, Associate Research Mining Engineer, authored the text of the State mineral industry information provided by the Montana Bureau of Mines and Geology.

Millstream Mines Ltd., Toronto, Ontario, Canada, drove a 62-m decline with a 15% grade at its Tamarack Mine near Sheridan, encountering a gold-bearing mineralization zone at the 42-m level. A 0.6-m-wide channel sample of this mineralization zone assayed 15.5 grams per metric ton (g/t) of gold (Millstream Mines Ltd., 2006b). Millstream began to stockpile mined ore at the mine portal and was developing a small mill near the mine to process the ore. A representative sample of the stockpiled ore assayed 10.2 g/t gold (Millstream Mines Ltd., 2006a).

At Marysville, RX Exploration Inc., Toronto, Ontario, Canada, drilled six holes at the Drumlummon Mine. Initial results from the drilling program indicated gold contents between 3.4 g/t and 5.2 g/t (RX Exploration Inc., 2007).

West of Marysville, Montana Molybdenum, Inc. completed preliminary mill testing of sample lots obtained from the Bald Butte Mine. Molybdenum recovery was low and was attributed to mineralogy problems associated with the mixed oxide/sulfide content of the sample lots of the ore. The company planned to continue exploration with an extensive drilling program at Bald Butte in 2007.

Near Helmville, Darden Engineering, Inc. identified previously unknown Tertiary channels of gold-bearing gravels in the foothills of the Finn District. Although the sampling was not complete, preliminary results indicated that the gold may have been from an epithermal source on the southern end of the mining district. Mapping results on the north end of the district revealed the possibility of a skarn source. The lode target may be the contact between Proterozoic middle belt carbonates and the granitic intrusive exposed at the top of the range.

Elkhorn Goldfields, Inc. further defined its current ore body near Elkhorn using angled diamond drilling methods, but ore body limits remained undefined on the north and east sides. The company received a permit to proceed with an exploration decline that will allow for definition drilling and obtaining of a bulk ore sample for milling test. Pump tests for dewatering the ore zone were completed during the year, as Elkhorn continued its development of the ore body toward the production stage. In 2007, the company planned to include drilling tests at the Mt. Haggin and Gold Hill ore zones as part of its overall development program. Elkhorn also purchased the Diamond Hill Mine and mill from Montana Tunnels Mining, Inc.

Northeast of Twin Bridges, Big Timber Minerals & Reclamation Inc. was in the process of developing a plan to mine the Johnson-Moffit copper skarn deposit. The ore body is garnet-chalcopyrite skarn along a highly altered granitic intrusive and limestone contact. Drilling by the USGS and the U.S. Bureau of Mines during World War II outlined a potential ore reserve that was further drilled by companies after the war. Big Timber completed a number of metallurgical tests on the deposit during the year. Results of these tests were considered favorable for continued sampling and testing of the ore body. The company planned to begin some open pit mining with recovery of the copper oxides attained using heap-leaching techniques. The sulfide zone of the ore body was being considered as an underground mining target. The copper would be recovered using conventional flotation mill processing.

Near Nye, Beartooth Platinum Corporation drilled 11 core holes in the Iron Mountain area. The intercepts in the "B" chromite zone were 0.6 m to 1.2 m wide with grades of 3.4 g/t total gold and platinum-group metals. The highest grade detected in the intercepts was 13.5 g/t total gold and platinum-group metals.

Trend Mining Company, Littleton, CO, continued drilling at the Mouat property southwest of the Stillwater Mine in the Beartooth uplift, but had to suspend exploration because of a forest fire. Trend planned to reopen the Mouat portal (Mountain View) in 2007, enabling an expanded sampling of the copper-nickel zone in the Stillwater Complex (Trend Mining Company, 2006).

Commodity Review

Industrial Minerals

Cement.—Holcim (U.S.), Inc. maintained steady cement production throughout the year at its Trident plant near Three Forks. Total production declined compared with that of 2005 as the market softened slightly in 2006. A draft environmental impact statement (EIS) was received pertaining to Holcim's proposal to partially substitute used tires for coal as a fuel in its operations. The final EIS was anticipated in the first half of 2007. Holcim's cement-kiln-dust recycling project was completed, resulting in less production of waste material.

Garnet.—Ruby Valley Garnet, LLC continued to modify its mill near Alder in order to decrease the hornblende content in concentrates obtained from the company's Red Wash deposit. Installation of additional spirals in the mill circuit yielded garnet concentrates in excess of 92% for the production of coarser-sized garnets. The company continued to search for a solution to a similar concentrate problem in the production of finer-sized garnets for use in the water-jet market. RubyValley also initiated an evaluation of garnet recovery from the dredge tails in upper Alder Gulch. Initial test results indicated 6% to 7% recoverable-garnet grades in the dredge tails.

Apex Abrasives Company was issued a permit to reprocess the garnet-rich tailings from the former General Electric tungsten mill south of Melrose. Apex planned to produce garnet and tungsten concentrates from the tailings. The recovered garnet sand was expected to be sold as water-jet cutting media. Remaining waste material was to be incorporated into the reclamation of the original tailings ponds at the tungsten mill. In this case, the waste of one mine has become the ore of another with resulting benefit to the environment.

Lime.—Graymont Western US Inc., Salt Lake City, UT, maintained production near the plant's capacity level at its Indian Creek burnt lime plant near Townsend. A recently completed drill program at the limestone quarry near the plant revealed that the thickness of the minable limestone zone doubles to the south of current mining operations. The purity of the limestone is sufficiently high to meet the requirements of the precipitated calcium carbonate market. The company was in the process of obtaining a life-of-mine expansion permit that would extend the current mine area by 745 hectares. Graymont also was constructing a haul road west of the boundary with the National Guard Firing Range.

Talc.—Barretts Minerals Inc. (a wholly owned subsidiary of Minerals Technologies Inc.) produced steadily at the Regal and the Treasure talc mines near Dillon. An environmental assessment for relocating the county road, which would isolate the road from the public, and redesign the waste dumps at the Regal Mine was in review. Additional ore definition drilling tests also were conducted at the Regal Mine. At the Treasure Mine, the company completed a long-term reclamation project of its waste-rock dumps. Improvements at Barretts' processing facilities included the installation of a new jet mill, silos, and a thickener. Transportation of material was a concern throughout the year as a result of difficulties in obtaining replacement tires for the company's large vehicles.

Production of talc by Luzenac America Inc. from its Yellowstone talc mine, south of Ennis, remained steady throughout the year. Luzenac received a Montana Pollutant Discharge Elimination System (MPDES) permit from the Montana Department of Environmental Quality for discharging water from its facilities. In addition, the company received a permit allowing for the storage of additional overburden from its mining operation. Luzenac became part of Rio Tinto Minerals in 2005 through a management consolidation of three industrial minerals companies.

Metals

Copper and Silver.—In the northwest corner of the State, Genesis, Inc. (a subsidiary of Revett Silver Company, Spokane, WA) continued production of copper and silver from the Troy Mine, processing ore at a rate of about 2,270 metric tons per day (t/d). Production rates were limited by a shortage of skilled labor, lack of access to ore feed material, and difficulties in acquiring equipment. Genesis initiated an extensive drilling program near the south adit during the year, targeting the two lower mineralized zones that had been successfully drilled at other locations in the mine. Preliminary drilling results from these zones indicated that the reserve base at the mine would likely be expanded to 7 years. Consideration was given to the possibility of backfilling the mined areas to facilitate pillar recovery as a mining method.

Revett Silver Company received permits to operate its Rock Creek Mine after earlier permits had been withdrawn by the U.S. Fish and Wildlife Service because of concerns voiced by local environmental groups. In receiving the permits, Revett Silver presented a more environmentally compatible plan of operation that included an agreement to fund a number of projects to assist in the preservation of grizzly bears and bull trout. Development of the mine was expected to take 5 years, beginning with the construction of a decline into the ore body in the spring of 2007.

Mines Management Inc., Spokane, WA, continued the repermitting process for its Montanore Mine, located in southwestern Montana. The former Noranda Mining Company, Toronto, Ontario, Canada, had relinquished the original permits when Noranda decided against developing the mine. Mines Management acquired the portal property for the decline, as well as the Hard Rock Operating permit, and the MPDES permit by acquiring Noranda Minerals Corporation and Norwin Resource Corporation from Noranda Finance Inc. This purchase enabled the company to accelerate the timetable for dewatering the decline and continue the project begun by Noranda. Mines Management planned to advance the decline 915 m and then drift an additional 3,050 m while developing stations for 13,700 m of diamond drilling. Current reserves at Montanore, without this additional drilling, reportedly were estimated to be about 73.9 million metric tons (Mt) grading about 70 g/t silver and 0.75% copper (Mines Management, Inc., 2006).

In Butte, Montana Resources, Inc. continued to upgrade facilities and equipment at its Continental Pit Mine. Focus was on mine support equipment and the electronic controls for operating the processing mill. The company also completed testing for development of the supergene zone between the Continental Pit and the Berkeley Pit, drilling large core holes to gather metallurgical samples for confirming the proposed milling process. The Pittsmont crosscut to the adjacent Berkeley Pit was grouted shut and a pump test was successfully completed to confirm that the supergene zone could be mined below the water level of the Berkeley Pit with the inflow of water controlled by pumps. Equipment availability and cost, however, were likely to slow the development of the supergene zone. Under current operations, the Continental Pit Mine has a projected life of about 17 years, but the development of the supergene zone could more than triple that life. During the year, additional resources also were discovered in an area north of the Continental Pit Mine. Montana Resources subsequently initiated overburden removal to access the newly discovered resources.

Gold.—Barrick Gold Corporation, Toronto, Ontario, Canada, continued mining at the Golden Sunlight Mine near Whitehall following Barrick's acquisition of the mine through the purchase of Placer Dome, Inc., Vancouver, British Columbia, Canada. Mining operations were focused on the stage 5b open pit, where ore production was maintained at about 27,000 t/d. This production level was expected to continue until 2008. Barrick also contracted to begin the process of reopening the underground mine located beneath the open pit mine. A new portal was to be constructed at a higher elevation than the original portal, which was buried as a result of a pit wall failure. Underground mining was anticipated to begin in mid-2007.

Prior to its sale to Barrick, Placer Dome had discovered three additional gold deposits separate from the current Golden Sunlight mining operations. Although these resources, the East, North, and Rattlesnake deposits, were identified by Placer Dome, they were not delineated. Barrick did not plan further exploration or development of these or other identified deposits in the near future.

Several individuals continued placer gold mining during the year. Reserves developed at Confederate Gulch, north of Townsend, were nearly exhausted on the north side of the drainage, but had not yet been developed on the south side. Near Nevada City, gold placer mining was completed in the lower third of the Browns Gulch. Reclamation was begun and was to be completed in mid-2007. Upstream resources remained untested by yearend.

Lead and Zinc.—Colorado-based Apollo Gold Corporation announced plans to reopen the Montana Tunnels Mine near Jefferson City in late 2006 through a joint-venture agreement with Elkhorn Tunnels, LLC, an affiliate of Calim Private Equity, LLC. Elkhorn Tunnels was to provide $13 million for up to 50% interest in Montana Tunnels. Milling operations were to begin in early 2007 following completion of a remediation program designed to taper the pit walls to a more stable slope angle. As part of the remediation, 4.5 Mt of rock and soil mass were to be removed from the upper benches of the east wall and 2.3 Mt of waste removed from the pit floor (Apollo Gold Corporation, 2006).

Platinum-Group Metals.—Stillwater Mining Company continued to operate its East Boulder and Stillwater Mines during the year, producing platinum-group metals as well as cobalt, copper, gold, and nickel. At the East Boulder Mine near Big Timber, a second ventilation raise was completed, and the tailings pond was expanded to the stage II height of the tailings embankment. Transition to a mainly cut-and-fill method of mining was begun because of a significant dip (inclined angle) in the ore body. The transition was expected to be completed in from 3 to 5 years. Use of the cut-and-fill method would result in an appreciable decrease in the amount of waste that is brought to the surface during mining, effectively reducing the dilution of the mined ore. Significant expansion of the reserve base at East Boulder also was achieved during the year.

At the Stillwater Mine near Nye, up to 50% of the ore was mined using the cut-and-fill method of mining. Efforts were continued to further increase the use of this mining method, so as to increase the grade of ore to be processed and reduce overall processing costs. In other activities, Stillwater installed rail haulage in the lower levels of the mine and completed a new sand backfill plant and distribution system in the upper west area of the mine. Also, a new exhaust ventilation raise was completed for the mine during the year. Stillwater's proven reserves were to be maintained at a level consistent with 40 months of planned production, according to a new company policy established in 2006.

At Stillwater's smelter complex in Columbus, the company planned to upgrade its laboratory facilities. Plans also were being developed to further expand the smelting capabilities and to increase the recycling of catalytic converters from automotive salvage.

Legislation and Government Programs

The MBMG continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the MBMG and others continued mapping geology in western and southwestern portions of the State under the STATEMAP and EDMAP programs. Many of the mapping activities served to create more detailed 1:100,000- and 1:24,000-scale maps from 1:250,000-scale maps previously published. New maps were published for the Culbertson, Plentywood, Scobey, and Wolf Point 30 x 60 minute quadrangles and a few 7.5 minute quadrangles. Development of a new State geologic map scale progressed during the year with a finished product expected in the near future. Mapping of both gold and sapphire placers continued; however, completed reports were not immediately anticipated. Current publications and activities can be accessed at http://www.mbmg.mtech.edu/.

The U.S. Government continued its process to transfer management of the National Guard Firing Range that includes some of Graymont's mine area, from the U.S. Bureau of Land Management to the U.S. Department of Defense. The Legislative EIS necessary to accomplish this transfer was not completed by yearend.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, bentonite		102	8,400	W	W	W	W
Gemstones, natural		NA	653	NA	644	NA	379
Palladium[3]	kilograms	13,700	102,000	13,300	87,100	14,400	150,000
Platinum[3]	do.	4,040	110,000	3,920	113,000	4,290	158,000
Sand and gravel, construction		14,400	80,000	14,000	83,600	13,700	95,300
Stone:							
Crushed		4,090	13,700	3,430 r	16,600 r	3,570	19,200
Dimension		14	2,550	12	2,620	12	2,620
Combined values of cadmium (byproduct in zinc concentrates),[4] cement [masonry (2005–06), portland], clays (common), copper, garnet [industrial (2005)], gold, lead, lime, molybdenum concentrates, peat (2004–05), silver, talc (crude), zinc, and values indicated by symbol W		XX	303,000	XX	543,000 r	XX	641,000
Total		XX	621,000	XX	847,000	XX	1,070,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Recoverable content of ores, etc.

[4] Data not available for 2006.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	4	2,550	$12,500	4	2,490	$13,700
Granite	3	110	862	9	101	793
Sandstone and quartzite	1	34	164	2	42	201
Traprock	2	W	W	2	W	W
Volcanic cinder and scoria	1	W	W	2	W	W
Miscellaneous stone	12	254	1,010	20	74	393
Total	XX	3,430 r	16,600 r	XX	3,570	19,200

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Concrete aggregate (+1½ inch), riprap and jetty stone	14	60
Coarse aggregate graded:		
Bituminous aggregate, coarse	W	W
Railroad ballast	W	W
Fine aggregate (-⅜ inch), stone sand (concrete)	W	W
Coarse and fine aggregates, unpaved road surfacing	W	W
Other construction materials	11	88
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Unspecified:[2]		
Reported	234	1,230
Estimated	2,400	13,000
Total	2,640	14,100
Grand total	3,570	19,200

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	14	60	--	--	--	--
Coarse aggregate, graded[3]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--	--	--
Coarse and fine aggregates[5]	W	W	--	--	--	--
Other construction materials	11	88	--	--	--	--
Chemical and metallurgical[6]	W	W	--	--	--	--
Unspecified:[7]						
Reported	74	388	159	833	1	4
Estimated	1,500	8,300	880	4,500	--	--
Total	2,520	13,800	1,040	5,380	1	4

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes riprap and jetty stone.

[3] Includes bituminous aggregate (coarse) and railroad ballast.

[4] Includes stone sand (concrete).

[5] Includes unpaved road surfacing.

[6] Includes cement and lime manufacture.

[7] Reported and estimated production without a breakdown by end use.

TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates and concrete products[2]	1,020	$9,920	$9.74
Asphaltic concrete aggregates and other bituminous mixtures	780	10,200	13.08
Road base and coverings[3]	2,880	15,300	5.30
Fill	576	3,680	6.38
Snow and ice control	53	234	4.42
Other miscellaneous uses	57	625	10.96
Unspecified:[4]			
Reported	2,860	16,700	5.84
Estimated	5,490	38,700	7.05
Total or average	13,700	95,300	6.95

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	817	8,560	201	1,350	--	--
Asphaltic concrete aggregates and road base materials[3]	2,600	20,600	743	3,450	318	1,430
Fill	475	3,450	101	227	--	--
Snow and ice control	53	234	--	--	--	--
Other miscellaneous uses[4]	52	558	5	67	--	--
Unspecified:[5]						
Reported	1,130	5,650	1,730	11,100	--	--
Estimated	4,340	30,600	1,150	8,090	--	--
Total	9,460	69,600	3,930	24,300	318	1,430

W Withheld to avoid disclosing company proprietary data; included with "Other Miscellaneous Uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

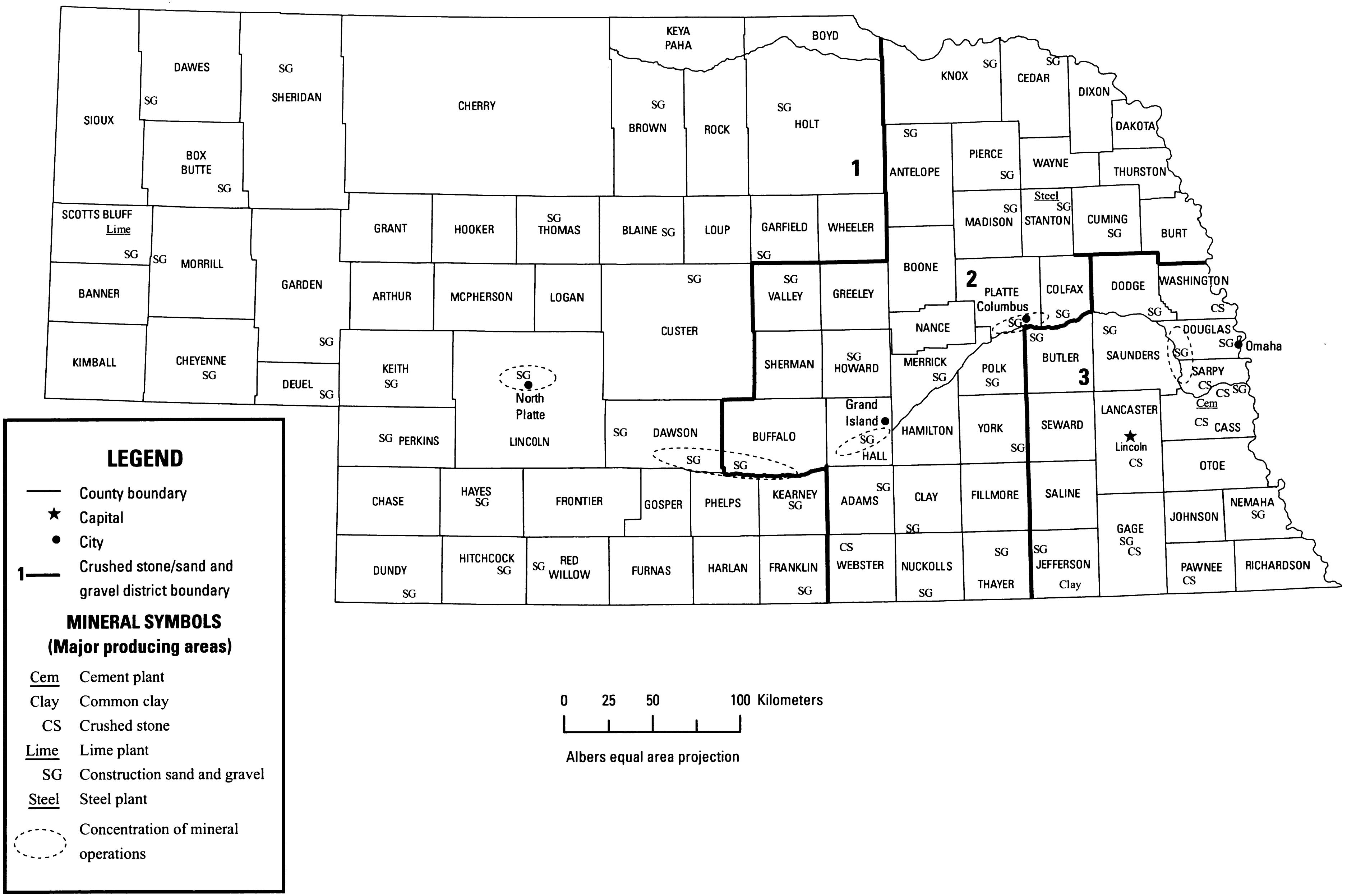
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Includes fill and railroad ballast.

[5] Reported and estimated production without a breakdown by end use.

NEBRASKA



Source: University of Nebraska-Lincoln, Nebraska Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEBRASKA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Nebraska-Lincoln, Nebraska Geological Survey, for collecting information on all nonfuel minerals.

In 2006, Nebraska's nonfuel raw mineral production[1] was valued at $129 million, based upon annual U.S. Geological Survey (USGS) data. This was a $14 million, or 12.2%, increase compared with that of 2005, which increased by $9 million, or 8.5%, from 2004 to 2005. (The State's actual total nonfuel mineral values for 2004–06 were substantially higher than those reported in table 1[2].)

In 2006, Nebraska's leading nonfuel mineral commodities were, in descending order of value, cement (portland and masonry), crushed stone, and construction sand and gravel. Cement led the State's mineral commodities with the largest increase in value. Crushed stone followed with an increase of slightly more than $12 million, and construction sand and gravel was up by nearly $2 million. Increases took place in the average unit values of all three. The increase in both types of cement commodities was significant. For crushed stone, while its production increased by 6%, its value rose substantially more, up by nearly 23%, and an 8% decrease in the quantity of construction sand and gravel produced, nevertheless, resulted in a 3% increase in its total value (table 1).

Nebraska continued to be a producer of significant quantities of construction sand and gravel in 2006 as compared with other producing States. Metals that were produced in the State—mostly raw steel—were processed from materials acquired from other domestic and foreign sources.

The following narrative information was provided by the Nebraska Geological Survey[3]—the Conservation and Survey Division of the University of Nebraska-Lincoln.

Commodity Review

Industrial Minerals

Aggregates.—The Kereford Limestone Co. of Weeping Water, South of Omaha in Cass County, continued to produce aggregate from the Plattsmouth and Kereford Limestone members of the Oread Formation of Pennsylvanian age.

Cement.—Ash Grove Cement Co. in Louisville, Cass County, continued to purchase approximately 50% of its low-magnesium limestone "low stone" needs from quarries in the Weeping Water area. The company suffered only two lost-time accidents in 2006. During 2006, Ash Grove Cement hired a local contracting firm to remove the overburden from a limestone resource on a property that the company purchased west of Weeping Water. Waste limestone piles were also to be processed from the site.

Fly Ash.—Nebraska Ash in Lancaster County was a division of NEBCO, Inc. NEBCO engineers pioneered the use of fly ash in Nebraska as a raw material for portland cement and concrete production and as a soil stabilization material, while bottom ash was utilized as a fill material and road aggregate. Formerly, all coal combustion products produced in Nebraska were disposed of in landfills. Nebraska Ash had operations in Omaha, Nebraska City, and Fremont (Nebraska Ash, 2004). Nebraska Ash used 261,000 metric tons (t) of fly ash in 2006, or 68.6% of the fly ash output from source powerplants. Nebraska Ash also used 71,400 t of bottom ash, or 87.4% of output from source powerplants. About 65% of the fly ash was used in Portland cement and subsequently in concrete and approximately 35% was used in soil stabilization. About 70% bottom ash is used as aggregate on county and farm roads and about 30% is used as aggregate in asphaltic concrete. Ongoing cooperative research among the Nebraska Department of Roads, public utilities, and the University of Nebraska was being conducted to determine suitable ash content for concrete used in the construction of roadways.

Stone, Dimension.— Whispering Creek Wall Rock of Weeping Water employed a workforce of three producing about 13-, 15-, 20-, and 25-centimeter (5-, 6-, 8-, and 10-inch)-thick rock from surface excavations in limestones of the upper Shawnee Group of Pennsylvanian age. The company produced a limited amount of aggregate from a 7.5-centimeter (3-inch) crusher run for use by local farmers. In addition to sales in the Lincoln-Omaha area, the company has had customers from as far away as South Dakota. The operation stockpiled topsoil and subsoil materials during stripping and engaged in terracing as part of its reclamation efforts in compliance with the Nebraska Department of Environmental Quality. B&R Wallrock, also located in Weeping Water, also produced wall rock.

Metals

Nucor Steel-Nebraska of Nucor Corp. continued to employ approximately 420 workers at its Norfolk plant, which was the producer of more than 400 grades of steel with a 97% recycled content. In 2006, more than 955,000 t (1.05 million short tons) of scrap steel was recycled by Nucor Steel-Nebraska, and the company's annual Earth Day scrap drive yielded nearly 34 t of scrap steel, 5,260 kilograms (11,600 pounds) of aluminum cans, and more than 14 t of computers, televisions, and other electronics.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Specific production values for masonry and portland cement, industrial sand and gravel (2004), and common clays (2005–06) have been withheld so as to not disclose company proprietary data.

[3] R.M. Joeckel, Research Geologist with the University of Nebraska-Lincoln and the Nebraska Geological Survey (NGS), authored the text of the State mineral industry information provided by the NGS.

Nucor Steel-Nebraska was an International Organization for Standardization (ISO) 9000 and 14000 registered facilities. ISO 9000 registration addresses issues and standards of quality management and ISO 14000 addresses the same regarding environmental management (International Organization for Standardization, 2009c). The ISO, a network of the national standards institutes of 159 countries, is the world's largest developer and publisher of international standards in the classification of materials, the manufacture of products, the provision of services, and the environmental performance of the manufacturer or provider (International Organization for Standardization, 2009a). Adherence to ISO standards contributes to making the development, manufacturing, and supply of products and services more efficient, safer, and cleaner with continued improvement to company or organization environmental performance (International Organization for Standardization, 2009b, p. 1). Although it is a nongovernmental organization, the ISO includes members from various governments in addition to those from private industry and private sector organizations, thereby receiving input from the public sector as it does from the private sector (International Organization for Standardization, 2009b, p. 2).

Nucor Steel-Nebraska is also a member of the U.S. Department of Labor's Occupational Safety and Health Administration's (OSHA) Voluntary Protection Programs (VPP) in which management, labor, and OSHA establish cooperative relationships at workplaces and have implemented a comprehensive safety and health management system. Approval into VPP is OSHA's official recognition of the outstanding efforts of employers and employees who have achieved exemplary occupational safety and health standards (U.S. Department of Labor Occupational Safety and Health Administration, 2009).

Mineral Fuels and Related Materials

According to the State of Nebraska, ethanol production increased to about 2.29 billion liters (604 million gallons) per year in Nebraska during 2006, continuing the recent overall increase in the rate of production that began from 2003 to 2004 (State of Nebraska, 2009, p. 6). This, in turn, increased the demand for fertilizer minerals and materials needed to grow ethanol's source materials. Public interest in ethanol rose because of its potential benefits to local economies, but concerns about the industry's demand for ground water, as well as other environmental issues, have been voiced in the State. Nonetheless, ground water use by ethanol plants in Nebraska remains a mere fraction of the total volume of ground water pumped annually from the State's aquifers.

Environmental Issues

Pollution from the former ASARCO, Inc. lead refinery in Omaha, which operated for more than a century before closing in 1997, continued to be one of the leading environmental issues in the State in 2006. Designated a Superfund site in 2003, soil at more than 30,000 Omaha properties was sampled for lead during 2005. More than 1,000 properties were remediated in the same year. As estimated by the U.S. Environmental Protection Agency in 2006, the cleanup would cost about $77.4 million during 5 years, and perhaps as much as $200 million in total by the time of completion. Omaha Healthy Kids Alliance (http://www.omahahealthykids.org/), a nonprofit organization, was formed in 2006 to coordinate lead cleanup at the local level.

Government Programs

The Conservation and Survey Division (CSD) of the Nebraska School of Natural Resources, Nebraska's State Geological Survey, continued as an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the CSD completed and delivered geologic maps of the Clinton SW, Dry Sheep Creek, Erdman Ranch, Kilpatrick Lake SW, Rushville, and Rushville SE, University Lake, University Lake SE, and Walton 7.5 minute quadrangles, which are available online at http://snr.unl.edu/csd/information/digitalgeologicmaps.asp.

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NEBRASKA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Cement:						
Masonry	W	(3)	W	(3)	W	(3)
Portland	W	(3)	W	(3)	W	(3)
Clays, common	133 e	338 e	160 e	(3)	158 e	(3)
Gemstones, natural	NA	4	NA	4	NA	4
Lime	11	514	12	625	13	700
Sand and gravel:						
Construction	15,100	53,200	14,300	60,200	13,100	62,000
Industrial	W	(3)	--	--	--	--
Stone, crushed	6,900	51,900	6,950	54,100 r	7,390	66,300
Total	XX	106,000	XX	115,000 r	XX	129,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2

NEBRASKA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	9	6,950	$54,100 r	9	7,390	$66,300

rRevised.

[1] Data are rounded to no more than three significant digits.

TABLE 3
NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Fine aggregate (-⅜ inch), screening (undesignated)	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surfacing	W	W
Roofing granules	W	W
Agricultural:		
Limestone	W	W
Other agricultural uses	W	W
Chemical and metallurgical, cement manufacture	W	W
Special, asphalt fillers or extenders	W	W
Unspecified:[2]		
Reported	2,880	26,700
Estimated	1,300	12,000
Total	4,140	38,400
Grand total	7,390	66,300

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,720	$7,410	$4.31
Plaster and gunite sands	74	225	3.04
Asphaltic concrete aggregates and other bituminous mixtures	526	4,110	7.82
Road base and coverings[2]	1,970	9,390	4.76
Fill	426	1,030	2.42
Snow and ice control	73	354	4.85
Filtration	3	21	7.00
Other miscellaneous uses[3]	32	727	22.72
Unspecified:[4]			
Reported	1,510	7,390	4.90
Estimated	6,760	31,400	4.64
Total or average	13,100	62,000	4.74

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Includes roofing granules.

[4] Reported and estimated production without a breakdown by end use.

TABLE 5

NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	661	3,040	W	W
Asphaltic concrete aggregates and other bituminous mixtures	117	671	376	3,240	32	196
Road base and coverings[3]	638	2,440	1,110	5,470	226	1,480
Fill	17	43	302	702	107	288
Snow and ice control	43	197	28	142	2	15
Other miscellaneous uses[4]	438	2,170	2	5	729	3,170
Unspecified:[5]						
Reported	35	248	15	180	1,460	6,960
Estimated	1,650	7,670	2,930	13,600	2,180	10,100
Total	2,930	13,400	5,420	26,400	4,740	22,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

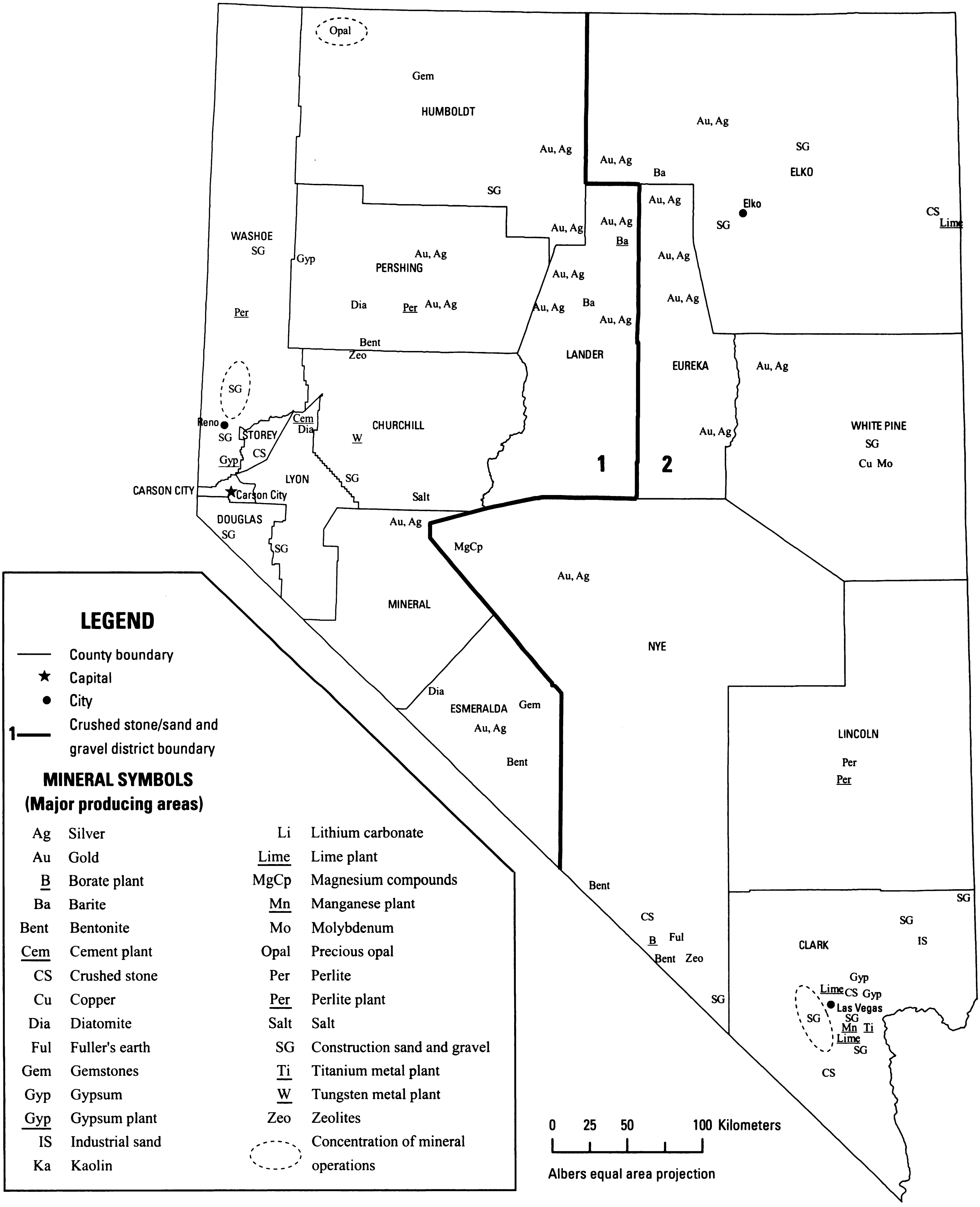
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (lime).

[4] Includes filtration and roofing granules.

[5] Reported and estimated production without a breakdown by end use.

NEVADA



Source: Nevada Bureau of Mines and Geology/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEVADA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Nevada Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2006, Nevada's nonfuel raw mineral production[1] was valued at $5.14 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $1.25 billion, a 32% rise from that of 2005, following a $420 million, or 12%, increase from 2004 to 2005. This again set an alltime high for the State, principally being the result of increases in the price of gold, a substantial increase in the annual average price of copper, and a significant increase in the annual average price of silver. The State rose in rank back to second from third in the Nation in total nonfuel mineral production value in 2006, which followed rankings of second 1994–97 and 1999–2004 and first in 1992–93 and 1998. Nevada accounted for more than 7.7% of the U.S. total nonfuel value in 2006.

Nevada, which has led the Nation in gold production since 1981, provided 82% of the Nation's gold in 2006. In 2006, gold accounted for 78% of the State's total nonfuel raw mineral production value, followed by copper (data withheld—company proprietary data), construction sand and gravel with nearly 4.5%, and silver, lime, and crushed stone with somewhat less than 2% each. For the fourth consecutive year, Nevada ranked second in silver production (first from 1987-2001) accounting for more about 21.5% of the silver produced from U.S. mines, down from 22% in 2005, 24% in 2004, 26% in 2003, and 30% in 2002.

In 2006, while the production of gold dropped slightly, down about 2.5%, its total value rose by 32%, or up by nearly $1 billion. A relatively small increase in copper production at the Quadra Mining Ltd.'s Robinson Mine, just west of Ely, White Pine County, resulted in a near doubling of its 2005 total value, owing to the commodity's increase in unit value. Although silver production in the State decreased by nearly 12%, nevertheless, total value rose by $26 million, or up by 40%. A modest increase in crushed stone production led to a nearly $20 million increase in its value. Smaller yet significant increases of somewhat more than $5 million each took place in the nonfuel mineral commodities of barite, diatomite, fuller's earth clay, gypsum (crude), molybdenum concentrates, and portland cement. The largest decreases in value took place in construction sand and gravel, down by $6 million, and lime, down by about $3 million. Although not significantly affecting the State's overall total nonfuel mineral value, the value of gemstone production was down about 40% (table 1).

In 2006, while Nevada continued to lead the Nation in the quantity of gold produced, it also continued to be the only State to produce magnesite and lithium carbonate minerals (minerals listed in descending order of value) and remained first of two barite-producing States, second in silver and diatomite, third in gypsum, fourth in copper, and sixth in lime. Nevada was sixth in the production of pumice and pumicite with the resumption of mining since last reported production of 1980. The State decreased to 9th from 6th in the production of construction sand and gravel, to 9th from 7th in gemstones (gemstones ranking based upon value), and was the producer of significant quantities of crushed stone and industrial sand and gravel. Mercury was produced as a byproduct of gold-silver processing at several mines, but no data were reported to the USGS. Mercury has not been mined domestically as a primary mineral commodity since the closure of the McDermitt Mine in 1992 (Brooks and Matos, 2005).

The following narrative information was provided by the Nevada Bureau of Mines and Geology[2] (NBMG). Production data in the text that follows are those reported by the NBMG as measured by mine shipments, sales, or marketable production (including consumption by producers) and were compiled by the Nevada Commission on Mineral Resources Division of Minerals (NDM) and the Nevada Bureau of Mines and Geology, based upon the surveys and canvasses of and estimates made by those State agencies, including information gathered from company annual reports (Price and Meeuwig, 2007, p. 3). The NBMG data are reported by that agency to be nonproprietary and may differ from some USGS production figures as reported to and estimated by the USGS.

Industry Overview and Trends

The value of mineral production in Nevada reached an alltime high in 2006, primarily as a result of increases in the price of gold and most all other commodities. Although production of gold continued to decrease from its high of nearly 277,000 kilograms (kg) (8.9 million troy ounces) in 1998 to 196,000 kg (6.3 million troy ounces) in 2006, nonetheless, 2006 represented the 18th consecutive year in which production was in excess of 156,000 kg (5 million troy ounces). Production of gold was derived from 22 major mining operations. The Carlin trend in northeastern Nevada accounted for 51% of the total production. Nine additional mining operations, not on the Carlin trend, each produced more than 3,100 kg (100,000 troy ounces) of gold. Most of this gold was sold on the international market for artistic items, bullion, and jewelry. The conductive and noncorrosive qualities also were applied in computers, other electronics, and dental-related items.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Jonathan G. Price, Director and State Geologist, Richard O. Meeuwig, Editor and Webmaster, Stephen B. Castor, Research Geologist, and John L. Muntean, Research Economic Geologist, coauthored the text of the State mineral industry information provided by the Nevada Bureau of Mines and Geology.

Through 2006, cumulative gold production in Nevada (beginning with the Comstock lode in 1859) was about 5,280 metric tons (t) (170 million troy ounces). Nearly 86% of this total was produced after the Carlin Mine began production in 1965, of which 83% was produced in the period from 1981 to the present. During this period, 45% of the gold was produced in the decade from 1997 to 2006. Total gold production in the United States, primarily since 1835, has been estimated to be about 16,200 t (521 million troy ounces, nearly 11% of total world gold production) with total Nevada production nearly 3% of total world production. The Carlin trend alone has accounted for 1.3% of total world production of gold.

The State's industrial minerals mining industry served to appreciably support the State's economic growth. Aggregate production reached an alltime high in 2006 as a result of Nevada's expanding population and the need for construction materials for airports, business structures, highways, homes, resort hotels, roads, and schools. Population growth was particularly strong in the Las Vegas metropolitan area (Clark County), where the influx of 9 to 10 new residents per hour resulted in approximately one hectare per hour of land development for businesses, homes, and roads (Ronald Lynn, Clark County building official, oral commun., December, 2006). New cement plants were planned for both the greater Las Vegas and Reno markets. Demand for construction raw materials was likely to remain strong as a result of the expected continuation of the State's growth in population. Gypsum production declined in 2006, relative to 2005, in part because of the closure of the Blue Diamond Mine on the perimeter of the Las Vegas Valley.

A trend occurring in the Las Vegas area, as well as nationwide, that combines post-mining use of aggregate quarries with its use in land development operations continued during the year. The eventual use of quarries for landfill operations, recreation sites, and suburban development has become vital in areas where urban expansion encroaches on the mineral resources.

Consolidation of Nevada's metal mining industry continued in 2006. Barrick Gold Corp. completed its acquisition of Placer Dome Inc. that included Placer's interests in the Bald Mountain, Cortez, and Turquoise Ridge Mines. In addition, Goldcorp Inc. acquired Glamis Gold Ltd., the operator of the Marigold Mine. Also, Midway Gold Corp. announced plans to acquire Pan-Nevada Gold Corp.

Employment

The mining industry directly employed 11,516 people in 2006. The industry also was responsible for another 52,000 jobs related to providing the goods and services needed by the industry and its employees (Driesner and Coyner, 2007a). Productivity of Nevada mining operations remained exceptionally high. Measured simply by the value of the commodities produced divided by the number of employees, each employee in the nonfuel mineral industry produced, on average, approximately $426,000 in mined products in 2006, an alltime high figure.

Exploration Activities, Discoveries, and Mine Development Activities

According to a survey of exploration activities by the Nevada Division of Minerals, exploration activity has been steadily increasing since 2001, when companies reported $51.2 million in expenditures in Nevada (Driesner and Coyner, 2007b). The 28 companies responding to the survey reported spending $164.9 million on exploration in Nevada in 2006, substantially higher than the $121.3 million reported in 2005 or the $79.7 million reported in 2004, and well above the level of $138.8 million in 1995.

Industrial Minerals

Developments in the industrial minerals sector continued in 2006. Notable exploration and mine staking activities took place in several commodities including barite, cement, clays, diatomite, gypsum, sand and gravel, stone (crushed), stone (dimension), and vermiculite (Castor, 2007, p. 63).

Barite.—After a sharp decline in barite mining in the 1980s and continuing weak sales of barite, exploration for barite was resumed in 2006. Excalibar Minerals Inc. (a division of Newpark Resources Inc.) with barite processing plants in Louisiana and Texas, staked nine claims near the southend of the Independence Mountains in Elko County. The claims are in the vicinity of the Heavy Spar barite prospect, which was explored by Eisenman Chemical Co. in the 1970s, and are near the Maggie Creek portion of the Carlin gold trend. Excalibar had staked 30 claims in another Elko County barite district in 2005. Spirit Minerals, LP filed an application for a reclamation permit to explore the Big Ledge Mine area in the Snake Mountains of Elko County, an area that was explored by Chromalloy American Corp. in the late 1970s and later mined by Circle A Construction Inc. in the 1990s. Spirit Minerals planned to begin milling 68,000 t of stockpiled ore mined in the 1980s by Old Soldier Minerals from another property in the area, and also staked 38 mill site claims on the east side of the Snake Range. Heemskirk Canada Ltd., which operates a barite processing plant in Alberta, Canada, using barite produced in Nevada, leased the Monitor barite property in the Northumberland District of Nye County. Milchem Inc. had produced barite from the Monitor Mine in the late 1970s.

Cement.—Nevada Cement Co., Fernley, Lyon County (part of Eagle Materials Inc., Dallas, Texas) staked claims in several areas near its Fernley cement plant. Twenty-five claims were staked on limestone deposits along the southwest edge of the Trinity Range in Pershing County, about 64 kilometers (km) northeast of the cement plant. A similar group of seven claims was staked in the Hot Creek Range, Churchill County, about 32 km northeast of the plant. A third group of four claims also was staked about 32 km south of Fallon, Churchill County. In addition, Nevada Cement prepared plans during the year for operation of a limestone quarry on claims staked in the early 1990s near Rye Patch Reservoir in Pershing County, about 113 km northeast of the Fernley plant. A plan of operations for this mine was to be submitted to the U.S. Bureau of Land Management (BLM) in early 2007. It was not disclosed to what extent the limestone properties staked in 2006 would be integrated with this plan.

Clay.—The Moltan Company staked nine placer claims over the San Emidio clay deposit near Empire in Washoe County in 2006.

Diatomite.—The Moltan Company also filed a block of about 100 claims, mostly placer claims, over diatomite in the Desert Peak area, Churchill County, about 40 km northeast of Fernley. The company also staked 18 claims over the Black Butte diatomite deposit near Hazen. EP Minerals LLC filed 35 placer claims over the Trinity diatomite deposit about 48 km northeast of Fernley in Churchill County in 2006.

Gypsum.—The site of the former Bpb Gypsum Inc. Blue Diamond Mine was slated to become a housing development, as a result of its location in the vicinity of metropolitan growth around the Las Vegas area. The Blue Diamond area had been the site of gypsum mining since 1925. The adjacent Blue Diamond wallboard plant continued production in 2006, using gypsum imported from northern Arizona. During the year, Bpb also filed five mill site claims adjacent to the wallboard plant.

Ready Mix Inc., a Las Vegas construction material supplier, staked eight placer claims in the area of the White Star gypsum prospect near Logandale, Clark County. It was unclear if gypsum was the commodity sought since decorative sandstone was known to be mined in the area.

Sand and Gravel and Stone, Crushed.—Objections to certain mining claims acquired by Rinker Materials Inc. in 2001 continued in 2006. Rinker had acquired claims on carbonate rock in the Sloan area south of Las Vegas, but in 2005, the BLM challenged these claims in Federal court. In 2006, the case was still under consideration, although a final ruling by the court was not expected to be imminent.

Nevada Aggregate Holdings continued to assemble a large block of claims in an area mostly underlain by carbonate rock about 24 km northeast of Las Vegas. In 2006, the company recorded more than 400 one-member placer claims in this area, and by yearend had more than 15 sections of land under claim. These claims are south of the Apex Landfill, which, in addition to accepting the Las Vegas metropolitan area's refuse, is the site of aggregate production for the Las Vegas metropolitan area. Las Vegas Paving Corp. staked a small number of eight-member placer claims to the north of the landfill. Frehner Inc. added 12 millsite claims to its patented claim block in the Sloan area south of Las Vegas, where it produces crushed carbonate aggregate. Companies that held claims on carbonate rock or other aggregate material in the Las Vegas area in 2006 include Diamond Generating Corp. and Sierra Ready Mix in the Ivanpah area, Frehner Inc. in the Sloan area, and Las Vegas Paving in the Dry Lake area.

Stone, Dimension.—Two small claim groups were staked for the probable purpose of dimension stone mining. State Stone Corp., a Salt Lake City wholesale construction materials supplier, staked three lode claims in Lincoln County about 48 km southeast of Caliente. Nevada Rock LLC, Carson City, staked seven claims in Nye County about 32 km east of Tonopah. The Nevada Rock claims are in the vicinity of the McKinney Tanks zeolite occurrence, and may have been staked for that commodity instead of stone.

Vermiculite.—In 2006, Rio Tinto Industrial Minerals exercised an option to acquire the IBI Corp. interest in vermiculite deposits near Mica Peak, Clark County. Under the agreement, Rio Tinto may acquire IBI's interest until 2008 for $1.25 million and is required to spend $250,000 on exploration and property development during the option period. The vermiculite occurs in altered Precambrian mafic and ultramafic rock in three claim blocks that include claims originally staked in 1993 and 1994. However, the presence of the vermiculite deposits near Mica Peak has been known since the 1930s. A mill was constructed there in the 1940s.

Zeolites.—The Moltan Company filed 15 lode claims in 2006 near a zeolite deposit in Churchill County about 56 km northeast of Fernley. In addition, Moltan staked 12 lode claims near the Ash Meadows Zeolite LLC mill in Nye County.

Metals

Metals exploration in Nevada continued in 2006 at an even greater pace than in 2005. County recorders registered 180,568 filings of mining claims in 2006, an 8.2% increase compared with that of 2005. These included filing new claims as well as maintaining existing claims. The BLM recorded the filing of 26,512 new claims in 2006. The predominant claiming areas were in the Humboldt Range, the Union Pass region of the Sulphur Springs Range, and the general vicinity surrounding the inactive Rosebud and Hycroft Mines north of Lovelock. Exploration drilling was carried out at 117 mining projects during the year. The main exploration activity continued to be directed toward gold, although an increasing number of projects focused on copper, molybdenum, silver, and tungsten. For example, 12 of the 117 projects drilled in 2006 targeted metals other than gold compared with that of 2005, when only 5 of 110 projects were drilled for metals other than gold.

Gold.—Most of the exploration drilling for gold, in terms of footage, continued to be conducted by major or midtier companies[3] in and near their active mines (Muntean, 2007, p. 14). As in 2005, most new mine reserves were the result of drilling that converted resources to reserves. Barrick Gold Corp. carried out a major drilling program in and near its Goldstrike Mine, both on the surface and underground. Barrick continued to drill at its South Arturo discovery northwest of Goldstrike on the Dee property at the northern end of the Carlin trend. A 40% interest in the Dee property is held by Goldcorp Inc. In addition to its drilling activities, Barrick initiated prestripping of the East Archimedes deposit where mining was scheduled to begin in 2007. With the acquisition of Placer Dome Inc., Barrick also completed major drilling programs at the Bald Mountain

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[3] As determined by the NBMG, the classification of companies into major, midtier, or junior in this section of the report is arbitrarily based on gold production and market capitalization. The loose criteria were as follows: 1) major companies produce greater than 1 million troy ounces of gold worldwide, and have market capitalization of more than $3 billion, 2) midtier companies produce between 50,000 and 1 million troy ounces of gold and have market capitalization less than $3 billion but more than $500 million, and 3) junior companies produce less than 50,000 troy ounces of gold and have market capitalization less than $500 million.

Mine and the Cortez Joint Venture in which Kennecott Minerals Co. has a 40% interest. The Cortez Joint Venture consists of the Cortez Mine and the Cortez Hills development project. Although no new discoveries were announced at the Cortez Mine, Barrick continued to expand the Cortez Hills deposit, especially the deep, high-grade lower zone. Barrick planned to begin production at Cortez Hills in 2009, which was expected to help alleviate declining production from Barrick's nearby Pipeline Mine. Major drill programs also were carried out by Newmont Mining Corp. at its Leeville, Gold Quarry, Genesis, Carlin, Pete, Phoenix, Twin Creeks, and Midas gold deposits. In addition, Newmont continued the permitting process for its Emigrant deposit. Other active mines with major drill programs in 2006 included Turquoise Ridge (75% Barrick, 25% Newmont), Marigold (67% Goldcorp, 33% Barrick), Jerritt Canyon (Queenstake Resources Inc.), and Robinson (Quadra Mining Ltd.).

Substantial drill programs also were carried out by major or midtier companies outside their active mine areas. Newmont continued to evaluate Northumberland, and by yearend 2006, had spent about $6 million toward the $25 million it was obligated to spend by 2010. The total expenditure would earn Newmont a 60% interest from its joint-venture partner NewWest Gold Corp. Centerra Gold Inc. continued to drill its REN project, a joint venture with Barrick, in the northern Carlin trend. Hecla Mining Co., in a joint venture with Great Basin Gold Ltd., completed a total of 2,150 meters (m) of underground development and about 17,000 m of drilling at the Hollister Mine in the Ivanhoe District. Drill results established thickness and continuity of high grades along veins, but Hecla decided to discontinue its participation in the joint venture. Great Basin planned to complete a feasibility study, and then make a decision in 2007 as to whether the Hollister Mine should be placed into production. Newcrest Mining Ltd. completed a significant drill program at its Gabbs project, which included the Sullivan Mine just north of the Paradise Peak that was last operated in the early 1900s. U.S. Gold Corporation began its drill program at Tonkin Springs, completing 17,000 m of drilling, which primarily served to test for extensions of known deposits.

Much of the drilling for gold by junior companies took place around known, unmined deposits or inactive mines, commonly with outdated resource estimates. In addition to expanding a given resource beyond its margins, an important objective of this drilling was to upgrade the resource estimate with infill and confirmation drilling in order to produce a new resource estimate that was compliant with current U.S. Securities and Exchange Commission regulations. Several major drill programs were conducted at sites including Borealis (Gryphon Gold Corp.), Fire Creek (Klondex Mines Ltd.), Jessup and Pan (Pan-Nevada Gold Corp.), Robertson (Coral Gold Corp.), Sandman (NewWest), and Toiyabe (Golden Oasis Gold Corp.). At Fire Creek, Klondex continued to drill at depths below the historical resource, and released a new mineral resource estimate of about 31,000 kg (one million troy ounces of gold) (Klondex Mines Ltd., 2006). In addition, new resource estimates were released during the year for Goldfield (Metallic Ventures Gold, Inc.), Lookout Mountain (Stacatto Gold Resources Ltd.), Monte Cristo (Gold Summit Corp.), New Pass (Bonaventure Enterprises Inc.), Pinson (Atna Resources), and Reward (Canyon Resources Corp).

Junior companies also conducted drilling at sites without known historical resources. Midway Gold Corp. continued to drill a new vein discovered in 2005 at its Midway project and announced a resource estimate for its Spring Valley project (Midway Gold Corp., 2006). The diatreme-hosted Spring Valley deposit, which sparked a staking rush in the Humboldt Range, represents a potentially new type of exploration target in Nevada. In addition, joint-venture partners (NewWest and Agnico-Eagle Mines Ltd.) continued to drill AuEx's Pequop properties (Long Canyon and Pequop West) near Wells in northeast Nevada. A major implication of the recent discoveries at the Pequop properties is that the sedimentary rock-hosted mineralization is distant from any of the known Carlin-type gold deposits and would likely attract companies to this relatively under-explored area of Nevada.

Some junior companies also planned to begin mine production at sites containing small quantities of gold resource. Royal Standard Minerals Inc. completed the permitting process for its Gold Wedge underground deposit in the Manhattan District and conducted preliminary mining tests during the year. Firstgold Corp. began the permitting process to reopen the Relief Canyon gold mine near Lovelock, which closed in the early 1990s.

Silver.—Drilling by Silver Quest Resources Ltd. (joint venture with Bullion River Gold Corp.) at its Corcoran Canyon project east of Round Mountain, Nye County, revealed a new resource zone containing up to 795 grams per metric ton (g/t) of silver over a 2.2 m-thick intercept. Silver Quest initiated a program of permitting in preparation for a larger drill program directed at the new discovery as well as the area of known silver occurrence. The known resource estimate of 1.61 million metric tons (Mt) grading 175 g/t silver and 0.86 g/t of gold was determined by Echo Bay Exploration in 1988 (Silver Quest Resources Ltd., 2007).

Piedmont Mining Co., in a joint venture with AuEx Ventures Inc., completed approximately 1,100 m of core drilling at the old Trinity Silver Mine in Pershing County. The drilling was designed to confirm silver mineralization encountered through earlier drilling in the 1980s, as well as to provide geological information on the nature of faults controlling the mineralization. Assay results revealed four of the 10 new core holes contained 1.5- to 3-m-thick intercepts of about 340 g/t silver with a high value of 890 g/t silver. These high grade zones were commonly enclosed within or accompanied by broader zones of lower grade mineralization grading approximately 34 g/t silver (AuEx Ventures Inc., 2006).

Fury Explorations Ltd. conducted about 3,000 m of drilling at the Taylor Mine near Ely in White Pine County. Results reportedly demonstrated continuity within the high-grade fault zone. The drilling delineated 500 m of strike length on the fault zone, with widths of about 3 m of silver mineralization grading up to 150 g/t silver (Fury Explorations Ltd., 2006).

General Metals Corporation completed the first stage of drilling on the tailings at its Independence Mine project, Battle Mountain District, Lander County. The Independence claims, covering about 100 hectares, are completely surrounded by

Newmont Mining's Phoenix Mine, but with legal access. Drill results from the tailings and an estimated 59,000 t of stockpiled ore suggested that the combined tailings and stockpiled ore contained more than 124 kg (4,000 troy ounces) of gold and nearly 7,800 kg (250,000 troy ounces) of silver that were potentially available for recovery by using heap-leaching techniques (General Metals Corporation, 2006).

Other Metals.—Canyon Copper Corp.'s (formerly Aberdene Mines) New York Canyon project in the Gabbs Valley Range, Mineral County, remained the most significant copper exploration project in 2006. Drilling at the copper oxide skarn deposit confirmed and expanded the known extent of the copper oxide mineralization, which is exposed at the surface and has been tested to depths up to 120 m. A resource estimate for New York Canyon was expected to be released in 2007. Canyon Copper staked more than 900 new claims in 2006, including much of the pediment on the west side of the Gabbs Valley Range.

At Pumpkin Hollow, Lyon County, Nevada Copper Corp. drilled several core holes confirming high-grade copper mineralization and continuity in the Northwest deposit. Copper mineralization averaging up to 1% was observed over an intercept thickness of 213 m.

Nevada Pacific Gold Ltd. conducted 3,400 m of exploration drilling at its Timber Creek project in Lander County, south of the Buffalo Valley Mine. The drill program was designed to test geophysical and structural areas that extend away from the front of the mountain range and onto the pediment. Mineralization of up to 0.09% copper and 0.21% zinc was observed over an intercept thickness of 30 m. The mineralization lies on the southeast edge of what appears to be an area of zoned base-metal mineralization related to the copper-molybdenum porphyry exposed in trenching about 900 m north of the area drilled.

Pacific Magnesium Corp. Ltd. drilled core holes totaling 1,700 m near the Ann Mason resource in the Yerington District, Lyon County. Continuity of copper mineralization was demonstrated over a 480-m intercept containing 0.5% copper. Small quantities of molybdenum and silver also were detected in the mineralization. Results of drilling southwest of the known Ann Mason deposit revealed a 3-m intercept of 0.6% copper within a 9-m intercept of 0.37% copper.

Boxxer Gold Corp. explored the iron deposits in the Buena Vista hills, Pershing County, for copper and gold mineralization. The downdip extension of a copper-bearing magnetite replacement body assayed 0.75% copper over a 1-m width at a depth of 94 to 103 m.

Quadra Mining Ltd. completed the molybdenum recovery circuit at its Robinson copper-molybdenum mine in White Pine County and began producing molybdenum, in addition to copper, gold, and silver. Quadra also continued exploration efforts to identify additional copper and molybdenum resources at Robinson (Quadra Mining Ltd., 2006).

Idaho General Mines, Inc. continued the permitting process for the Mount Hope porphyry molybdenum deposit north of Eureka. The company submitted a plan of operations to the BLM and initiated various baseline studies necessary to complete an environmental impact statement for Mount Hope. Idaho General also expanded its land position by staking 651 claims around Mount Hope in 2006. In addition, it acquired the Hall deposit north of Tonopah and began to assess whether production of the remaining resources at Hall was economically feasible. Idaho General expanded its land position by staking 417 claims around Hall in 2006 (Idaho General Mines, Inc., 2007).

After nearly 20 years of inactivity, interest in the production of tungsten was resumed in the State. Galway Resources began an evaluation of the Indian Springs tungsten skarn deposit north of Wells, Elko County. Indian Springs had undergone extensive exploration drilling and metallurgical testing during the period 1968 through 1986. The deposit contains both high-recovery, scheelite-bearing mineralization and lower-recovery, non-scheelite, iron-oxide-bearing tungsten mineralization. In 2006, Galway conducted a 2,100-m drilling program at Indian Springs that served to verify earlier ore grade intercepts and extend the known mineralization.

Golden Predator Mines, Inc. acquired the Springer Tungsten Mining and Milling Complex near Imlay from General Electric Company in November 2006. The Springer Mine and mill had opened in early 1982 at a cost of $55 million through a joint venture between General Electric and Utah International, but was closed in October 1982 as a result of declining tungsten prices. The facilities had remained on care-and-maintenance status since that time. Although acquisition of Springer allows Golden Predator the opportunity to potentially produce tungsten, a planned addition of a separate gold processing circuit and utilization of existing water rights and tailings infrastructure could make the Springer complex the only independent operating gold mill in northern Nevada.

Gold Canyon Resources, Inc. continued to explore for gallium near the historic Cordero mercury mine near McDermitt, Humbolt County. Gold Canyon completed a 4,700-m drilling program and released an inferred resource for the Cordero project of 6.45 Mt grading 52.3 g/t gallium (Gold Canyon Resources, Inc., 2006).

Commodity Review

Industrial Minerals

Barite.—Three major operations in Lander and Elko Counties combined to produce more than 95% of the barite mined in the United States. M-I SWACO, which is jointly owned by Smith International Inc. and Schlumberger Ltd., was the leading Nevada barite producer in 2006. Production of crude and ground barite was derived from the company's Greystone Mine and Battle Mountain processing plant, both in Lander County. M-I SWACO introduced a new grade of barite with lower specific gravity of 4.1 (compared with the American Petroleum Institute specific gravity specification of 4.2) following cost and performance analyses. The specific gravity adjustment was intended to extend barite reserves in Nevada. Baroid Drilling Fluids Inc. (a subsidiary of Halliburton Co.) was the second leading producer in Nevada. The company mined barite from the Rossi Mine in Elko County, which was then processed at Baroid's Dunphy Mill in Eureka County. Baker Hughes INTEQ, the third leading producer, shipped barite from its Argenta operation near Battle Mountain in Lander County. Most of the barite sold domestically is used as a weighting agent in oil and gas well drilling fluids. On the basis of data supplied by Schlumberger Ltd., the total oil and gas drill rig count for Canada and the United States declined by about 2% in 2006, compared with a drill rig count increase of 12% in 2005.

Boron.—American Borate Co. processed borate minerals at the Lathrop Wells mill in Nye County. Until 2005, the feed was colemanite mined from the Billie Mine in Death Valley, CA. In 2006, however, the feed for the Lathrop Wells mill was imported. The mill capacity is about 20,000 metric tons per year (t/yr) boron trioxide basis.

Cement.—Nevada Cement Co., Fernley, Lyon County, was the sole producer of cement in the State during the year. Nevada Cement is a wholly subsidiary of Eagle Materials Inc., Dallas, TX. The cement is manufactured from Tertiary lacustrine limestone mined a few miles south of Fernley, and from other raw materials acquired from locations in northern Nevada.

Ash Grove Cement Co., a Kansas corporation, planned to begin construction of a major cement plant in late 2007. The plant, under consideration since 2004, is to be located northeast of Las Vegas on the Moapa Indian Reservation. Annual production capacity of the plant is expected to be about 1.4 Mt. Limestone feed for the plant is to be acquired from a quarry on the reservation. Although the plant site is on an Indian reservation, which is not subject to as many State and Federal laws as other lands, Ash Grove will adhere to environmental regulations required by the U.S. Environmental Protection Agency (EPA), and has applied for an air quality permit. The EPA has determined that the use of proposed control devices and emission limits for the plant meet the requirements of 40 CFR 52.21 (prevention of significant deterioration of air quality) and that the proposed plant project will not violate any of the National Ambient Air Quality Standards. It is anticipated that production of cement from the new plant will assist in significantly reducing cement shortages that have affected Las Vegas concrete suppliers and construction firms periodically in the 1990s and as recently as 2005.

Clay.—IMV Nevada (owned by Mud Camp Mining Company, LLC) produced bentonite, saponite, and sepiolite from deposits in lacustrine sediments in the Ash Meadows-Amargosa Flat area of Nye County. The clay occurs in shallow, flat-lying deposits in Pliocene lacustrine rocks. The clay is processed at a plant in Amargosa Valley, after which the clay products are exported worldwide. The saponite and sepiolite deposits have unusual geology, in that they are considered to have originated in a Pliocene playa with an area of at least 57 square kilometers (km^2). The sepiolite, which yields most of the profits for the company, occurs in an almost continuous bed with an average thickness of about 2 m.

Two companies mine and ship relatively minor amounts of Nevada clay from several sites for use in high-value specialty products. At its White Caps Mill near Beatty in Nye County, Vanderbilt Minerals Co. processes small amounts of clay stockpiled from several deposits in Arizona, California, and Nevada. In 2006, Vanderbilt shipped clay from the Blanco Mine in Esmeralda County, the Buff and Satin Mines in Pershing County, and the New Discovery Mine near Beatty. The American Colloid Co. mines white bentonite from its Nassau property in Coal Canyon in Pershing County for use in specialty clay products. Information was not available on whether the company shipped clay from Nevada in 2006.

Diatomite.—The United States is the leading producer of diatomite worldwide. Nevada accounts for more than 30% of domestic diatomite production. About two-thirds of the diatomite produced in Nevada is used in filtration systems, and the remainder is mainly used in absorbents, fillers, and cement. Emerging small-scale uses include pharmaceutical processing and nontoxic insecticides.

EP Minerals LLC, the second leading diatomite producer in the world, produced most of Nevada's diatomite. EP Minerals' Colado operation in Pershing County produced filtration materials at its Lovelock plant from diatomite mined about 24 km to the northwest. Filler and absorbent materials were produced at its Clark plant from diatomite mined in Storey County about 32 km east of Reno, and insulation materials were produced from diatomite mined near Hazen in Lyon County. EP Minerals' former parent company, Eagle-Picher Holdings, filed to reorganize under Chapter 11 of the U.S. Bankruptcy Code in April 2005. In 2006, the company emerged from restructuring under the name Eagle Picher Incorporated.

The Celite Corp. operated a mine at Hazen and a plant in Fernley that produced diatomite for use as fillers. Celite is a subsidiary of World Minerals Inc., the world's leading diatomite producer, and a subsidiary of Imerys, a large French industrial minerals company. The Moltan Company shipped absorbent products, cat litter, and soil conditioner under several labels from a mine and plant complex in Churchill County about 32 km northeast of Fernley. Grefco Minerals' relatively small diatomite operation near the Esmeralda/Mineral County line continued to produce diatomite in 2006. American Diatomite Inc. holds claims in Esmeralda County near the Shu Fly diatomite deposit about 16 km north of Coaldale.

Gemstones.—Precious opal is produced from several mines in the Virgin Valley area of northern Humboldt County. The best known are the Bonanza, Hidden Valley, Rainbow Ridge, and Royal Peacock Mines. The Rainbow Ridge and Royal Peacock Mines reported production in 2006 to the Nevada Division of Minerals. Virgin Valley is a well-known source of gemstones in North America, but much of the opal comes from pay-to-dig operations and is unreported. In addition, Nevada is estimated to have produced more than $30 million worth of turquoise, mostly during the first half of the 20th century when as much as 4,500 kg was produced in a single year. In 2006, less than 23 kg of turquoise was shipped from the Blue Ridge Mine, a family-owned property in the Bullion District of Lander County.

Gypsum.—Nevada's gypsum production declined for the third consecutive year. This decline was mainly the result of cessation of mining in 2004 at the Bpb Gypsum, Inc. Blue Diamond's operation south of Las Vegas was one of the State's leading producers. The two leading Nevada producers in 2006, PABCO Gypsum and USG Corp., utilized most of the gypsum mined in Nevada in the production of wallboard at plants adjacent to their mining operations. Processing of gypsum ore at PABCO's Clark County plant yielded a product that was about

70% by weight gypsum. The ore was recovered from a nearly flat-lying late Miocene gypsite blanket atop a 13-km^2 mesa. Results of drilling have indicated that the gypsum ore is at least 36-m thick in the area of current mining. USG mined gypsum in western Pershing County and processed it into wallboard and plaster at its plant in Empire, Washoe County. The gypsum is of Triassic or Jurassic age and forms several masses in a 5-km^2 area. The largest mass, the Selenite orebody, contains 85% to 95% gypsum.

The Art Wilson Company, Carson City, shipped anhydrite and gypsum from the Adams Mine in Lyon County, and the D.L. Denman Construction Company mined gypsum at the Pioneer Mine about 16 km east of Las Vegas. Material from these relatively small operations was used in agricultural and cement applications. The Adams deposit is a folded body associated with limestone in Triassic metavolcanic rocks. The Pioneer Mine exploits the same late Miocene gypsite deposit as the PABCO operation about 8 km to the north.

Lime, Limestone, and Dolomite.—The Pilot Peak high-calcium lime operation of Graymont Western US, Inc. (formerly Continental Lime, Inc.) 16 km northwest of Wendover, Elko County was Nevada's leading lime producer, mainly marketing to gold-mining operations for use in cyanide-solution pH control. The Pilot Peak plant has three kilns with a combined capacity of more than 635,000 t/yr of quicklime, and a hydrated lime plant capable of producing about 320 metric tons per day (t/d).

Chemical Lime Co. produced lime at Apex, about 32 km northeast of Las Vegas. The operation manufactured high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The company also produced dolomitic lime and hydrated high calcium lime at Apex, mainly for construction uses. Chemical Lime's Henderson plant processed Type S hydrated dolomitic lime for building and home construction.

In addition to lime, Graymont Western and Chemical Lime also shipped crushed limestone. The limestone used by Chemical Lime and Graymont Western was recovered from two sites that are nearly at opposite ends of the State. However, the high-calcium limestone mined at both sites is from the same Devonian limestone unit.

Min-Ad, Inc. and Nutritional Additives Corp. near Winnemucca produced dolomite for use in agricultural and nutritional products. The Min-Ad operation (a subsidiary of Inter-Rock Minerals Inc., Toronto, Ontario, Canada) has increased production by about 70% during the past 10 years. The dolomite is distributed mainly to locations in midwestern United States, but also is distributed as far as New York State and Alberta, Canada, for use in beef and dairy feed.

Lithium.—Nevada was the only State with domestic production of lithium raw materials. Chemetall Foote Co. (a subsidiary of Chemetall GmbH) produced lithium carbonate, lithium hydroxide monohydrate, and lithium hydroxide anhydrite at its Silver Peak facility in Esmeralda County. The lithium chemicals were produced by solar evaporation/preconcentration and subsequent refining techniques from brine that was pumped from beneath Clayton Valley playa. Lithium imports have increased about 75% since 2001, principally of growth in the lithium-based rechargeable battery market.

Magnesium.—Magnesium minerals, brucite, and magnesite have been mined at Gabbs Valley in Nye County since 1935. In the 1940s, the minerals were processed in Henderson, NV, to produce magnesium metal. From the 1950s to the 1980s, mining and processing was carried out by Basic Industries, a major producer of refractory magnesia. Premier Chemicals LLC, Cleveland, OH, currently owns the Gabbs operation. During the 1990s, the availability of inexpensive foreign refractory magnesia caused production at Gabbs to be shifted to light-burned (caustic) magnesia that was marketed mainly for wastewater treatment and agricultural uses. Although production of magnesia at Gabbs was well below the peak reached in 1981, magnesia shipments from the Gabbs operation increased steadily between 1996 and 2005. Production in 2006 was somewhat lower than in 2005.

The Gabbs operation currently is the only location in the United States where magnesite is mined. Brucite, which is shipped in relatively small amounts from the Gabbs operation, is also mined in Texas. Slightly less than 50% of domestic magnesia production is derived from brucite and magnesite. The remainder comes from seawater and natural brines. Brucite and Magnesite at Gabbs occur as complex replacement bodies in Triassic dolomite in a large area. The resource is thought to be sufficient for more than 50 years of production at present mining rates.

Perlite.—Although Nevada has significant perlite resources and several deposits of perlite that have been mined extensively, the State now produces only minor amounts of perlite. Current perlite production in Nevada is restricted to relatively small-scale mining of two deposits for niche markets that produce less than 1% of the domestic total.

Wilkin Mining and Trucking Inc. mines perlite from the Tenacity Perlite Mine about 40 km west of Caliente in Lincoln County. The company has been mining perlite in the area for more than 25 years. In 2006, Wilkin also operated a small popping plant in Caliente where expanded perlite was produced for horticultural purposes.

EP Minerals LLC produced expanded perlite at its Colado diatomite plant in Pershing County. The perlite was marketed as a filter aid. Plant capacity was about 7,300 t/yr. The crude perlite was obtained from the Popcorn Mine about 24 km south of Fallon in Churchill County.

Potassium Alum.—A small amount of potassium alum (kalinite) was shipped in 2006 from a deposit in Esmeralda County about 16 km north of Silver Peak. The kalinite, which occurs with sulfur as veins and stringers in rhyolitic rock, was being marketed for horticultural use.

Salt.—The Huck Salt Company produced salt for use mainly in the deicing of roads. Production in 2006 was down nearly 50% compared with that of 2005, consistent with the production level being weather dependent. The salt was mined from a playa on Fourmile Flat about 40 km southeast of Fallon in Churchill County. Salt has been harvested almost continuously since the 1860s from this site, when it was hauled to the mills to process Comstock silver and gold ore.

Silica.—In 2006, Nevada's major silica producer, Simplot Silica Products, Overton, Clark County, shipped a quantity of silica sand equivalent to that shipped in 2004 and 2005.

The sand was mined from a large open pit in the relatively friable Cretaceous Baseline Sandstone, washed in the pit, and transported via an 8-km slurry pipeline to a plant where it was screened and bagged. Simplot planned to upgrade its processing facilities in the near future. The upgrade was expected to increase production of silica products to nearly 770,000 t/yr.

American Cement and Aggregate produced silica sand from the Ordovician Eureka Quartzite about 5 km southeast of Mercury in Nye County. A plan of operations submitted to the BLM in 2001 called for annual production of nearly 73,000 t. The product, which contains about 98% silicon dioxide (SiO_2), is used mainly as construction sand. The company also holds claims that cover an abandoned quarry in Eureka Quartzite that contains more than 99% SiO_2 in Clark County.

Sand and Gravel and Stone, Crushed.—Production from sand and gravel deposits accounted for about 65% of aggregate production statewide, with crushed stone and lightweight aggregate making up the balance. Construction aggregate produced in the Las Vegas area in 2006, estimated to be about 30 Mt, was slightly lower than in 2005. Sand and gravel operations accounted for about 75% of the aggregate used in the Las Vegas metropolitan area in 2006. As in past years, the Lone Mountain area in northwest Las Vegas remained the most important source of sand and gravel aggregate, accounting for more than 9 Mt in 2006. Significant production also came from sand and gravel pits and stone quarries south and northeast of Las Vegas, and in the El Dorado Valley area west of Boulder City. Sand and gravel from portable crushers at construction sites were also important producers of base aggregate in Las Vegas. Companies in the Las Vegas area that produced more than 0.9 Mt of aggregate in 2006 were American Sand and Gravel, CTC Crushing, Frehner Construction Company, Inc., Las Vegas Paving Corp., Nevada Ready Mix Corp., Rinker Materials, and Wells Cargo. Companies with production in excess of 450,000 t/yr were Granite Construction and Hollywood Sand and Gravel. Las Vegas Paving, a major producer of asphalt concrete, produced sand and gravel from its Blue Diamond and Lone Mountain pits. The company also produced crushed stone from the Apex landfill about 16 km northeast of Las Vegas. Nevada Ready Mix (a subsidiary of the Mitsubishi Corporation) mined most of its aggregate from a complex of pits in alluvium in the Lone Mountain area, with minor production coming from quarries in adjacent bedrock. Frehner Inc. (a subsidiary of the Swiss company Holcim) mined and crushed limestone from its Sloan property a few miles south of Las Vegas. Rinker Materials (a subsidiary of the Australian-based CSR Group) produced crushed granite from the El Dorado pit near Railroad Pass. Community pits and other aggregate mining facilities administered by the BLM and operated by several companies contributed about 7.3 Mt to the Las Vegas area total in 2006. American Sand and Gravel and Hollywood Sand and Gravel produced aggregate from community pits. The Southern Nevada Lightweight operation near Jean produced aggregate for lightweight concrete block and sand for use in stucco. Lightweight aggregate was also shipped to the Las Vegas market by the Cind-R-Lite Block Company from a cinder operation near Amargosa Valley in Nye County.

More than 8 Mt of construction aggregate was produced in the Reno-Sparks-Carson City area in 2006, about 15% more than in 2005. Companies in the area that produced more than 0.9 Mt of aggregate were Granite Construction Co., Martin Marietta Materials Inc., and RMC Nevada. Granite Construction produced aggregate from several pits in the area, but the bulk of the company's production was of crushed andesite and crushed granitic rock from its Lockwood and Hidden Canyon pits, respectively. RMC Nevada owns the former All-Lite Aggregate crushed rhyolite operations and Paiute Pit Aggregates sand and gravel operations. Most of Martin Marietta's production came from the Rocky Ridge Quarry north of Sparks, which produced crushed granitic rock. A & K Earthmovers also produced more than 0.9 Mt, but much of this was fill material. Rilite Aggregate Co. and Frehner Construction Co., Inc. were also important producers. Crushed rock accounted for about 60% of the aggregate used in 2006 in the Reno-Sparks-Carson City area. Lightweight aggregate, an important component of crushed rock production in the area, was produced by Basalite Concrete Products LLC, Rilite Aggregate Co., and RMC Nevada.

More than 4.5 Mt of aggregate was likely produced outside of the major metropolitan areas in Nevada in 2006. Operators in Nye County together produced more than 1.8 Mt of aggregate in 2006, mostly in the Pahrump area. Elko and Lyon Counties each produced more than 270,000 t. Lincoln and Churchill Counties each produced more than 180,000 t, and Lander and Douglas Counties each produced more than 90,000 t. Other rural Nevada counties are thought to have produced less than 90,000 t of aggregate each in 2006.

Stone, Dimension.—Mt. Moriah Stone Quarries, LLC mined flaggy quartzite of several colors from the Cambrian Prospect Mountain Quartzite at a quarry about 24 km north of Baker in White Pine County. This material, which naturally splits into large slabs, is used for ashlar (uncut facing stone), flagstone, and other types of uncut building stone.

Las Vegas Rock produced ashlar, boulders, crushed landscape rock, and flagstone from its Rainbow Quarries near Goodsprings, about 32 km southwest of Las Vegas. The stone was mined from the Jurassic Aztec Sandstone.

Zeolites.—Nevada contains large known resources of zeolite. However, zeolite production has been small and no zeolite was mined in 2006. Ash Meadows Zeolite LLC (a subsidiary of Badger Mining Corp.) ships 1,000 to 5,000 t/yr of clinoptilolite used in water filtration, odor control, and nuclear cleanup from a plant in Amargosa Valley in Nye County. The clinoptilolite is mined from a small open pit in California in a large area of zeolite deposits that extends into Nevada.

Metals

As reported by the NBMG and the NDM, Nevada produced 194,000 kg (6.32 million troy ounces) of gold, 264,000 kg (8.49 million troy ounces) of silver, 58,000 t (127.5 million pounds) of copper, and 259 t (570,500 pounds) of molybdenum in 2006.

Gold.—Gold production was down 16,700 kg (537,000 troy ounces) compared with that of 2005, marking the sixth consecutive year of declining production. Twenty-four mines in Nevada reported gold production in 2006. Fifty-one percent of production came from mines on the Carlin trend. A 55%

decrease in production from the Cortez Mine (60% Barrick, 40% Kennecott) contributed significantly to the decline in Nevada's gold productions in 2006. The decrease in production at Cortez was attributed to the mining of some lower grade ore from the remaining reserves at the Pipeline openpit complex.

Barrick Gold Corp., with production from its Betze Post, Meikle, Cortez (60% share), and Turquoise Ridge Mines (75% share), plus its 50% share of the Round Mountain Mine's production, and 33% share of the Marigold Mine's production, produced a total of 92,900 kg (2.99 million troy ounces) of gold, the highest in Nevada. Barrick was able to maintain its top spot by completing its acquisition of Placer Dome Inc. (including its Cortez, Bald Mountain, and Turquoise Ridge Mines) in 2006. For the seventh consecutive year, Barrick's Betze Post Mine was Nevada's most productive gold mine, with an output of 44,500 kg (1.43 million troy ounces). Barrick's Meikle Mine, the largest underground mine in Nevada, produced 14,930 kg (0.48 million troy ounces).

Newmont Mining Corp. reported production of 72,470 kg (2.33 million troy ounces) of gold, the second highest in Nevada, from its Carlin Trend Mine, and from the Twin Creeks, Lone Tree, Mule Canyon, Midas, and Phoenix Mines (plus its 25% share of the Turquoise Ridge joint venture with Barrick). Newmont's Carlin Trend Mine produced 40,750 kg (1.31 million troy ounces).

Royal Standard Minerals Inc. completed the permitting process and began preliminary mining tests at its Gold Wedge underground deposit in the Manhattan District, Nye County. Ore is hosted predominantly by the Ordovician Zanzibar Limestone. The first gold production was expected in 2007 with a planned throughput of 450 to 635 t/d.

Silver.—Nevada's production of silver in 2006 accounted for 24% of the U.S. total and 1.4% of the world total. Much of Nevada's silver production, which totaled 264,000 kg (8.49 million troy ounces), was a coproduct or byproduct of gold mining. Coeur d'Alene Mines Corp.'s Rochester Mine maintained its place as the leading silver mine in Nevada with production of 159,000 kg (5.11 million troy ounces). The Rochester Mine was considered a primary silver operation in that the silver production value from the mine exceeded that of gold, based upon the average price of gold and silver at a ratio of 52:1 in 2006. The quantity of silver produced from the Rochester Mine in 2006 was 71 times greater than that of gold. Mining at Rochester was expected to end in 2007, although leaching recovery was to continue until 2011.

As in 2005, Newmont's Midas Mine was the second leading silver producer at 52,700 kg (1.70 million troy ounces). The Round Mountain Mine followed in third place, producing 20,000 kg (0.64 million troy ounces) of silver.

Other Metals.—In 2006 Idaho General Mines, Inc. acquired its second large molybdenum project, the Hall-Tonopah project. The Hall-Tonopah property includes the former Hall molybdenum deposit, which was operated as an open pit mine between 1982 and 1991 by the Anaconda Company and Cyprus Minerals, Inc. Extensive diamond drilling during the Anaconda era resulted in finding and delineating a deposit estimated to contain 180 Mt at a grade of 0.091% molybdenum. During this period, approximately 45 Mt was mined and processed at an approximate grade of 0.11% molybdenum.

Golden Phoenix Minerals Inc., Vicksburg District, Humboldt County began production at its small underground Ashdown molybdenum mine and shipped its first concentrate in December 2006. The mineralization is hosted in a narrow quartz vein, the Sylvia vein, characterized by bands of high-grade molybdenite. Masses of nearly pure molybdenite, assaying up to 46% molybdenum were encountered in the Ashburn deposit. Diluted head grades delivered to the mill for processing averaged between 1.75% and 4.75% molybdenum.

Copper production was mainly from Quadra Mining Inc.'s Robinson Mine. Overall production was increased in 2006 with the opening of Newmont's Phoenix Mine, which produced 2,800 t of copper. Newmont expected Phoenix to produce 6,800 to 11,300 t/yr of copper when in full operation.

Mine Reclamation Award

Newmont Mining Corp. was presented an award in the category of Wildlife Habitat Enhancement for its work at the Bootstrap Mine in Elko County near Carlin. Newmont's unique design revegetation strategy served to create a very wildlife friendly site. Newmont's use of variable topography and native seed mixes allowed wildlife to rapidly repopulate the mine area. The waste rock disposal areas at the Bootstrap Mine were considered to be an excellent example of proactive concurrent mine reclamation and successful post-mining land use for enhanced wildlife habitat. The Nevada Excellence in Mine Reclamation Award is given cooperatively by the Nevada Division of Minerals, Nevada Division of Environmental Protection, Nevada Division of Wildlife, U.S. Bureau of Land Management, and the U.S. Forest Service. There have been 51 projects and 6 individuals recognized since the awards program began in 1990 (Dreisner and Coyner, 2006).

Government Programs

Through a survey conducted early in 2007, the Nevada Division of Minerals collected data for NBMG Special Publication P-18, Major Mines of Nevada 2006. This publication includes, in handbook form, location maps, names and telephone numbers of operators, numbers of employees, and nonproprietary production figures for most mines in Nevada. The publication also contains a section on economic impacts of the industry. The full contents of this 28-page publication are available, free of charge, at www.nbmg.unr.edu. Additional information about the Nevada mineral industry and the overall United States gold industry, including the contents of selected publications, also are available at this Web site, as well as the Nevada Division of Minerals Web site (http://minerals.state.nv.us/). In 2006, the NBMG also released Map 149, Gold and Silver Resources in Nevada, which illustrates the locations of 943 deposits and is supported by a database with coordinates and references (Davis and others, 2006).

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NEVADA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	7	W	W	W
Fuller's earth	W	W	25	W	W	W
Gold[3] kilograms	216,000	2,850,000	212,000	3,030,000	206,000	4,010,000
Sand and gravel, construction	43,100	197,000	52,300	230,000	45,500	224,000
Silver[3] kilograms	302,000	65,000	276,000	65,200	245,000	91,300
Stone, crushed	9,760	72,800	9,460 [r]	67,900 [r]	10,200	87,500
Combined values of barite, brucite (2004), cement (portland), clays (kaolin), copper, diatomite, gemstones (natural), gypsum (crude), lime, lithium carbonate, magnesite, molybdenum concentrates, perlite (crude), pumice and pumicite (2006), salt, sand and gravel (industrial), zeolites, and values indicated by the symbol W	XX	286,000	XX	488,000	XX	724,000
Total	XX	3,470,000	XX	3,890,000 [r]	XX	5,140,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values data." XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Recoverable content of ores, etc.

TABLE 2

NEVADA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	6	4,710	$26,700	6	5,220	$36,200
Dolomite	3	W	W	3	W	W
Granite	5 r	3,240	23,400	5	3,410	28,000
Volcanic cinder and scoria	2	W	W	2	W	W
Miscellaneous stone	4 r	1,080 r	6,790 r	4	1,110	9,880
Total	XX	9,460 r	67,900 r	XX	10,200	87,500

r Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate, graded, concrete aggregate (coarse)	W	W
Coarse and fine aggregates, other	W	W
Agricultural, other	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Sulfur oxide removal	W	W
Special, mine dusting or acid water treatment	W	W
Unspecified[2]		
Reported	2,810	20,200
Estimated	4,800	44,000
Total	7,630	63,700
Grand total	10,200	87,500

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND BY DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate graded[2]	--	--	W	W
Coarse and fine aggregates[3]	W	W	--	--
Agricultural[4]	W	W	--	--
Chemical and metallurgical[5]	W	W	W	W
Special[6]	--	--	W	W
Unspecified:[7]				
Reported	2,070	14,900	739	5,300
Estimated	880	6,500	3,900	37,000
Total	3,880	38,500	6,290	49,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes concrete aggregate (coarse).

[3] Includes other coarse and fine aggregates.

[4] Includes other agricultural uses.

[5] Includes cement and lime manufacture and sulfur oxide removal.

[6] Includes mine dusting or acid water treatment.

[7] Reported and estimated production without a break down by end use.

TABLE 5

NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,820	$14,700	$8.06
Plaster and gunite sands	108	992	9.19
Concrete products (blocks, bricks, pipe, decorative, etc.)	125	1,120	8.98
Asphaltic concrete aggregates and other bituminous mixtures	623	5,980	9.59
Road base and coverings[2]	2,920	14,700	5.04
Fill	1,170	5,600	4.81
Snow and ice control	31	208	6.71
Other miscellaneous uses[3]	617	2,910	4.71
Unspecified:[4]			
Reported	13,100	36,600	2.80
Estimated	25,100	142,000	5.65
Total or average	45,500	224,000	4.93

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Includes filtration and railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	496	4,080	1,430	11,600	125	1,100
Asphaltic concrete aggregates and road base materials[3]	1,290	9,500	2,260	11,200	--	--
Fill	921	4,670	245	939	--	--
Other miscellaneous uses[4]	600	2,650	49	467	--	--
Unspecified:[5]						
Reported	3,340	15,600	134	2,500	9,570	18,500
Estimated	4,940	28,000	20,100	114,000	--	--
Total	11,600	64,500	24,200	140,000	9,700	19,600

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

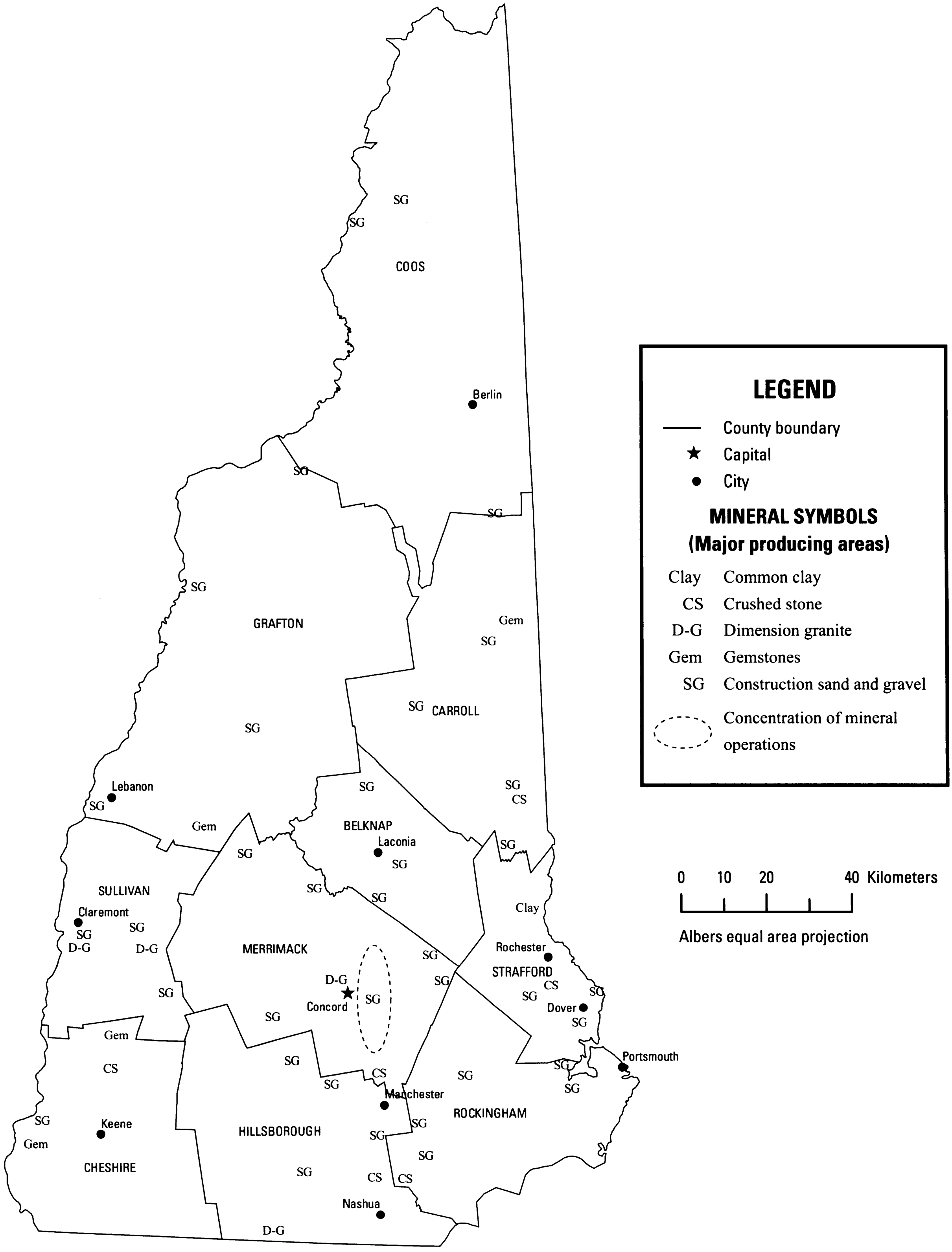
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (lime).

[4] Includes filtration, railroad ballast, and snow and ice control.

[5] Reported and estimated production without a breakdown by end use.

NEW HAMPSHIRE



Source: New Hampshire Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEW HAMPSHIRE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Hampshire Geological Survey for collecting information on all nonfuel minerals.

In 2006, New Hampshire's nonfuel raw mineral production[1] was valued at $112 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 27% increase from the State's total nonfuel value of $88.2 million of 2005, which followed a 25% increase from 2004 to 2005. Because data for dimension granite have been withheld (company proprietary data), the State's actual total nonfuel mineral values for 2004–06 are higher than those reported in table 1.

Construction sand and gravel, a high-volume, low-unit-value mineral commodity, remained New Hampshire's leading nonfuel mineral commodity in 2006, accounting for nearly 55% of its nonfuel raw mineral production value, and it led the State's increase in value in 2006. A 13% increase in construction sand and gravel production led to a $14.2 million, or 30%, rise in the commodity's value. Similarly, a 17% increase in crushed stone production resulted in a significant increase ($10 million) in its value, or up nearly 25%. The value of dimension stone (granite) showed a small decrease, while that of gemstones remained unchanged (table 1).

Although dimension stone production decreased slightly, New Hampshire continued to produce significant quantities of the commodity in 2006, and rose to 12th from 13th among 34 dimension stone-producing States.

The following narrative information was provided by the New Hampshire Geological Survey[2] (NHGS).

Exploration

Active exploration in New Hampshire continued in 2006 for economic deposits of sand, gravel, and aggregate. The William Wise Mine in Westmoreland continued to yield green fluorite for decorative uses. The beryl produced in Alstead was mostly for faceted pieces. Ruggles Mine in Grafton is the oldest mine in the United States for beryl, feldspar, quartz, mica, and other pegmatite minerals. It is New Hampshire's only mine open to the public and provides a place where visitors can look for minerals.

Commodity Review

Industrial Minerals

Common Clays.—New Hampshire's extensive marine and lacustrine clays were used only for on-demand local resource, as borrow material for the base of land fills, for lining of ponds and in the core of dams. New Hampshire glacial tills that are rich in silt and clay were also used for these same purposes.

Sand and Gravel, Construction.—Demand for sand, gravel, and aggregates was level for the first half of the year, but dropped in the 3d and 4th quarters in response to sharp increases in diesel fuel and liquid asphalt costs. The higher prices affected both ongoing and future projects. The number of public projects declined sharply owing to cuts in the State's highway and public works construction project lists, but the private project market remained steady because of ongoing work. Applications for building permits and other regulatory authorizations for new projects decreased in the second half of the year in response to fuel cost increases and decreases in the availability of inexpensive credit. Some essential construction activity is underway in the State, and no increase is expected until fuel and construction material prices decline. Prices for sand, gravel, and stone-based aggregates remained stable or increased slightly, particularly in the second half of the year, in response to higher diesel fuel costs. Producers were unable to increase their prices sufficiently to completely offset the higher costs as demand began to weaken at about the same time. The only users of these commodities that were not significantly affected were the very small project contractors whose pricing and quoting procedures are much more flexible than those otherwise subject to detailed agency scrutiny. Resources of sand and gravel continue to become depleted, although the speed of such depletion is slowing as extraction rates decrease. Resources of stone-based aggregates, however, remain abundant and largely unexploited on a statewide basis. The trend away from exploiting granular aggregate resources in favor of stone-based sources continued at a slower pace than in recent years. Applications for new pit excavations and quarries remained stable during the year. A sand, gravel, and aggregate operation in the west central part of the State continued to process till from a large exposure near its aggregate pit. Processed till continued to find a market in material for dirt roads and highway shoulder work because it compacts well. Clay rich tills were used in applications requiring material with low permeability.

Stone, Dimension.—The demand for New Hampshire's granite curbing has been comparable with that of the previous year according to Swenson Granite Works in Concord. The State's major producers of dimension stone are Concord's Swenson Granite Company and the Massachusetts-based Fletcher Granite Company, with its quarry in Milford, NH. Both quarries cut from the Concord gray two-mica granite, and both are moving to the use of diamond wire saws, replacing the drills that are currently in use to cut granite blocks from the bedrock. New Hampshire has several other smaller, independent operations, also quarrying the Concord granite. Their production was used mostly for landscaping, with minor amounts cut into dimension stone in 2006. A new quarry in Acworth owned by the Allstate Corporation in Chester, VT, supplied granite gneiss used for building facing and architectural dimension stone. Mineral collecting from New Hampshire's many pegmatites continued strong in 2006 owing to the increase in prices for natural resources and commodities.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Lee Wilder, Public Outreach Coordinator for the New Hampshire Geological Survey, authored the text of the State's mineral industry information provided by that agency.

Government Programs and Activities

New Hampshire has realized the need to protect existing and future water supplies from development. The need for protecting ground water aquifers is reaching critical proportions because of the continued increase in rural housing, and the commercial demands for processing and bottling water. Many of the State's best aquifers are located in stream valleys where it is easier to build and underlie housing or other infrastructure. Registered ground water withdrawals for 2006 remained flat. NHGS also planned to expand its ground water monitoring network by drilling several additional bedrock wells. Currently the network contains only one bedrock well. By adding the additional bedrock wells, the expanded network will better serve as an indicator of regional hydrologic conditions in the bedrock as well as the overburden. In addition to expanding the geographic coverage of the network, NHGS hopes to gather long-term data on the ambient conditions in the bedrock aquifers. Demand continued for NHGS's geologic mapping products for reliable aquifer information.

The NHGS continued to be an active participant in the STATEMAP program, with various map projects in the works. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the Hopkinton (Tile 149) and the Pittsfield (Tile 138) quadrangles were mapped at the 1:24,000 scale.

The NHGS continued public outreach by answering public inquiries regarding the State's bedrock, general geology, and geologic information, ground water, minerals, and surficial materials. Geologic inquiries come in the form of emails, telephone calls, and visitors. In northern New Hampshire, there was an increased interest in gold panning based on the number of inquiries to NHGS. Outreach and education efforts included staff working with State and local governments, participation in workshops, conferences, field days, Earth Science Week, classroom presentations, and public lectures. Inquiries may be sent to geology@des.state.nh.us. The NHGS's lunchtime lecture series increased in popularity. Lectures were focused on areas of current geological interest. Publications on the State's minerals, bedrock, surficial geology, and ground water resources may be obtained by contacting the Public Information Center of the Department of Environmental Services at URL http://www.des.state.nh.us/geo1link.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW HAMPSHIRE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	6	NA	6	NA	6
Sand and gravel, construction	8,940	46,600	8,400	47,400	9,500	61,600
Stone:						
Crushed	4,720	23,900	5,100	40,900	5,950	50,900
Dimension, granite	W	(3)	W	(3)	W	(3)
Total	XX	70,500	XX	88,200	XX	112,000

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Granite	7	2,080	$16,400	9	2,650	$23,300
Traprock	7	3,020	24,400	7	3,300	27,600
Total	XX	5,100	40,900	XX	5,950	50,900

XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Coarse aggregate graded:	W	W
Bituminous aggregate (coarse)	W	W
Other graded coarse aggregate	W	W
Fine aggregate (-⅜ inch), stone sand, bituminous mix or seal	W	W
Unspecified:[2]		
Reported	3,940	34,500
Estimated	1,200	9,700
Total	5,950	50,900

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	281	$2,320	$8.25
Asphaltic concrete aggregates and other bituminous mixtures	365	3,220	8.82
Road base and coverings[2]	1,000	7,150	7.13
Fill	559	2,000	3.58
Snow and ice control[3]	86	623	7.24
Filtration	16	201	12.56
Golf course	10	120	12.00
Unspecified:[4]			
Reported	814	5,000	6.14
Estimated	6,370	41,000	6.43
Total or average	9,500	61,600	6.48

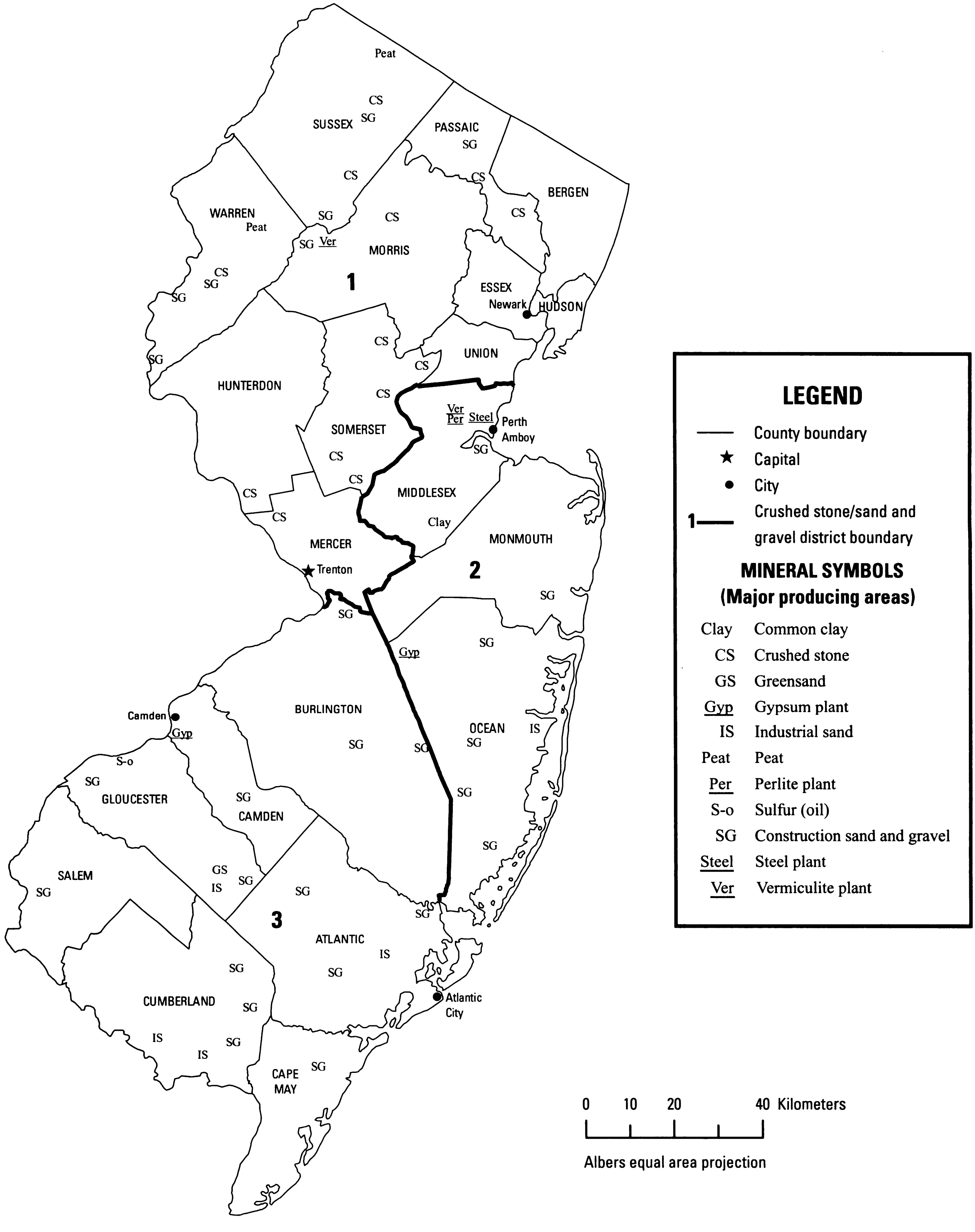
[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Includes railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

NEW JERSEY



Source: New Jersey Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEW JERSEY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Jersey Geological Survey for collecting information on all nonfuel minerals.

In 2006, New Jersey's nonfuel raw mineral production[1] was valued at $401 million, based upon annual U.S. Geological Survey (USGS) data (table 1). (Revisions to table 1 quantity, value, and total data for 2006 are to be published in the Minerals Yearbook 2007.) This was a $45 million, or 12.6%, increase compared with that of 2005, which was up 4.4% from 2004 to 2005. Construction sand and gravel and crushed stone, by value, were New Jersey's leading nonfuel mineral commodities, followed by industrial sand and gravel and greensand marl.

In 2006, the largest increases in value took place in construction sand and gravel and industrial sand and gravel. Because of a significant increase in the unit value of construction sand and gravel, the mineral commodity's value rose by $47 million, despite a small decrease in production. Similarly, a 16% decrease in industrial sand and gravel production resulted in a $6.5 million, or 19%, increase in its value in 2006. Additionally, a significant increase took place in the unit value of common clays. The largest decrease in value took place in crushed stone, down by $3 million, mostly the result of a somewhat small decrease in production. Relatively small decreases also took place in the production and value of greensand marl (table 1).

New Jersey continued to be the only State to produce greensand marl and it decreased to eighth from fifth in the quantity of industrial sand produced. Greensand marl was used directly as an organic conditioner and fertilizer for soils and as a water filtration medium to remove soluble iron and manganese from well water. Additionally, the State's aggregate operations produced significant quantities of construction sand and gravel and crushed stone as compared with other producing States.

The following narrative information was provided by the New Jersey Geological Survey[2] (NJGS).

Mine Employment

Sand and gravel and aggregate mining continued to be a significant industry in the State during 2006. During the first 6 months of the year, employment in the natural resources and mining supersector declined by 100 positions to a level of 1,800, according to the New Jersey Department of Labor and Workforce Development (NJDLWD) statistics (New Jersey Department of Labor and Workforce Development, 2006). The natural resources and mining supersector rebounded slightly in the second half of 2006, adding a total of 100 employees by yearend compared with yearend 2005 (New Jersey Department of Labor and Workforce Development, 2007).

Commodity Review

Industrial Minerals

Sand and Gravel, Construction and Stone, Crushed.—Mining of sand and gravel was carried out in two new pits in 2006. Crown Aggregates LLC opened an additional sand and gravel pit at its operation in Montague, and Braen Aggregates LLC reopened a previously operated limestone pit within the Franklin Marble in Ogdensburg. Surface mining operations, including sand and gravel pits, and aggregate quarries, which remained active during the year were essentially equivalent to those of 2005. No underground mining activity took place during the year. Mine registration certificates administered by the Office of Mine Safety & Compliance, NJDLWD decreased by about 4% from the period March 2005–March 2006 to the period March 2006–March 2007. Certificates are required for all quarries, underground mines, sand and gravel, and borrow pit operations, as well as portable crushers that are active in the State, and may include offsite material processing operations. There continued to be a lack of development of new mining properties within the State, a pattern which has existed during the past 20 years. However, some quarrying of short-term duration and limited scope did take place at various construction sites around the State during the year.

Government Programs and Activities

The New Jersey Department of Environmental Protection, through its "Green Acres" land preservation program, purchased 2,000 hectares (ha) of mined property or adjacent surplus land from 13 corporations. Three companies accounted for 87% of the total area purchased. The companies included U.S. Silica Company (839 ha), Egg Holding Corporation (692 ha), and Hummus Land Company (218 ha).

Further investigation of the extent of environmental contamination at the Ringwood Mines led the U.S. Environmental Protection Agency to restore the site to Superfund status. Contamination is related to refuse dumping in several of the small mines at the site. Ringwood Mines also continued to be an area of additional environmental concern associated with mine collapse and the undermining effect on a housing development.

The NJGS updated the Geographic Information System point shapefile and associated database file and metadata for "Selected Sand, Gravel and Rock Surficial Mining Operations in New Jersey" (Digital Geodata Series DGS05–1). Associated information outlines point locations, products mined, geologic formation, and other attributes of selected sand, gravel, and rock surficial mining operations in the State. The database contains 1,031 inventoried operations with 172 being registered with the New Jersey Department of Labor, Office of Mine Safety & Compliance. Some operations have multiple permits. As a result, there are a total of 167 operational sites and 864 inactive and abandoned surficial mining operations. Inactive and abandoned operations were included because of their importance in environmental investigations, planning, zoning, and resource evaluation.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Andrea L. Friedman, Principal Geologist, authored the text of the State mineral industry information provided by the New Jersey Geological Survey.

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New Jersey Department of Labor and Workforce Development, 2006, Midway through 2006, New Jersey remains on pace: New Jersey Department of Labor and Workforce Development press release, July 19, 2 p. (Accessed September 30, 2008, at http://lwd.dol.state.nj.us/labor/lwdhome/press/2006/0719unemployment.html.

New Jersey Department of Labor and Workforce Development, 2007, New Jersey added 2,000 jobs in December; Unemployment rate dropped to 4.2 percent: New Jersey Department of Labor and Workforce Development press release, January 17, 3 p. (Accessed September 30, 2008, at http://lwd.dol.state.nj.us/labor/lwdhome/press/2007/0117unemployment.html.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NEW JERSEY[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	122	W	W	84	216
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	20,100	120,000	21,200	145,000	20,900	192,000
Industrial	2,020	35,800	1,820	34,100	1,520	40,600
Stone, crushed	25,400 [3]	185,000 [3]	24,500 [r]	172,000 [r]	46,300 [4]	315,000 [4]
Combined values of greensand marl, peat, stone [crushed miscellaneous (2004)], and value indicated by the symbol W	XX	4,400	XX	4,110	XX	(5)
Total	XX	345,000	XX	356,000 [r]	XX	547,000 [4]

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

[4] Revisions to these 2006 data to be published in the USGS Minerals Yearbook 2007—Quantity: 24,100; Value: 169,000; Total: 401,000.

[5] Value withheld to avoid disclosing company proprietary data.

TABLE 2
NEW JERSEY: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	2	W	W	1	W	W
Granite	8	8,900 [r]	$63,400 [r]	7	8,320	$58,000
Traprock	15	15,500 [r]	108,000 [r]	15	37,800 [3]	256,000 [3]
Miscellaneous stone	(2)	W	W	(2)	W	W
Total	XX	24,500 [r]	172,000 [r]	XX	46,300 [3]	315,000 [3]

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Sales/distribution yards.

[3] Revisions to 2006 data to be published in the USGS Minerals Yearbook 2007—Traprock Quantity 15,800 and Value 110,000; Total Quantity: 24,100 and Total Value: 169,000.

TABLE 3
NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregate	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	W	W
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Screening, undesignated	W	W
Other fine aggregate	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	W	W
Unspecified:[2]		
Reported	10,800 [3]	72,700 [3]
Estimated	4,700	32,000
Total	15,500 [3]	105,000 [3]
Grand total	46,300 [3]	315,000 [3]

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

[3] Revisions to 2006 data to be published in the USGS Minerals Yearbook 2007—Unspecified Reported Quantity 15,100 and Value 102,000; Unspecified Total Quantity 15,500 and Value 133,000; Grand total Quantity: 24,100 and Value: 169,000.

TABLE 4
NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		District 3	
Use	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	--	--
Coarse aggregate, graded[4]	W	W	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--
Coarse and fine aggregate[6]	W	W	--	--
Unspecified:[7]				
Reported	10,700 [8]	72,500 [8]	30	233
Estimated	4,700	32,000		
Total	46,200 [8]	314,000 [8]	30	233

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 2.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[7] Reported and estimated production without a breakdown by end use.

[8] Revisions to 2006 data to be published in the USGS Minerals Yearbook 2007—District 1 Unspecified Reported Quantity 15,100 and Value 102,000; Unspecified Total Quantity 24,100 and Value 168,000.

TABLE 5
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,840	$45,100	$9.32
Plaster and gunite sands	270	2,860	10.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	282	3,820	13.55
Asphaltic concrete aggregates and other bituminous mixtures	3,040	30,200	9.92
Road base and coverings	830	6,330	7.63
Fill	1,320	7,680	5.82
Snow and ice control	69	553	8.01
Other miscellaneous uses[2]	470	5,300	11.27
Unspecified:[3]			
Reported	1,380	11,900	8.61
Estimated	8,410	78,000	9.27
Total or average	20,900	192,000	9.17

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes filtration.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,610	18,800	1,340	13,000	2,440	19,900
Asphaltic concrete aggregates and road base materials	303	2,500	2,950	29,400	615	4,610
Fill	619	4,270	195	1,230	505	2,170
Other miscellaneous uses[3]	285	3,780	13	50	241	2,020
Unspecified:[4]						
Reported	28	361	--	--	1,350	11,500
Estimated	519	4,920	3,190	29,000	4,700	44,100
Total	3,360	34,700	7,690	72,700	9,850	84,300

-- Zero.

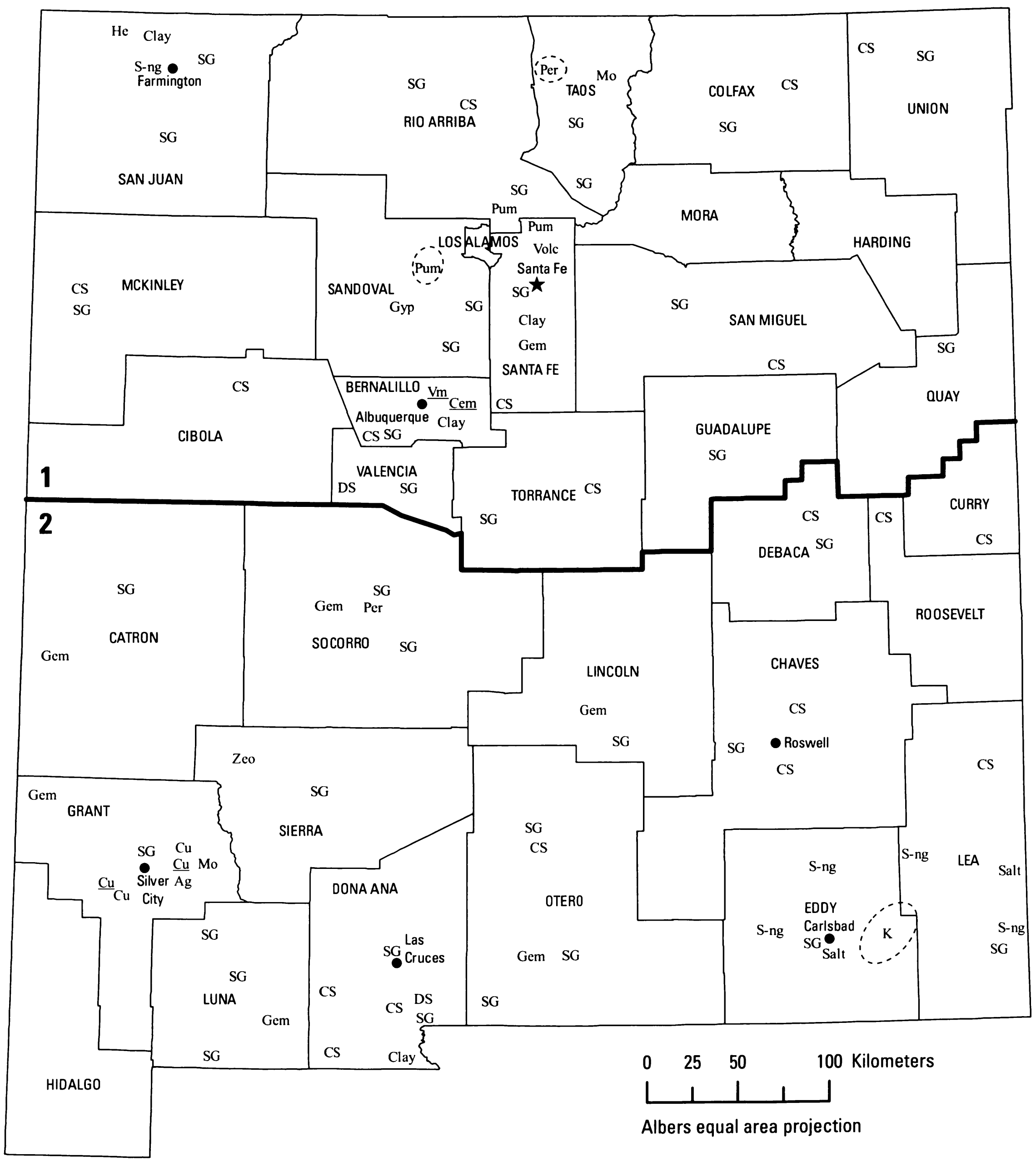
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration and snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

NEW MEXICO



LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper
DS	Dimension stone
Gem	Gemstones
Gyp	Gypsum
He	Helium
K	Potash
Mo	Molybdenum
Per	Perlite
Pum	Pumice and pumicite
S-ng	Sulfur (natural gas)
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Volc	Volcanic cinder
Zeo	Zeolites
◌	Concentration of mineral operations

Source: New Mexico Bureau of Geology and Mineral Resources/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Geology and Mineral Resources for collecting information on all nonfuel minerals.

In 2006, New Mexico's nonfuel raw mineral production[1] was valued at $1.47 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $320 million, or nearly 28%, increase from the State's total nonfuel mineral value for 2005, which then had increased by nearly $282 million, or up 32.5%, from 2004 to 2005. The State rose to 15th from 19th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 2% of the U.S. total. Yet, per capita, the State ranked 7th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 1.96 million, the value of production was about $754 per capita.

The top nonfuel minerals in 2006 were, by value of production, copper and potash, followed by construction sand and gravel, molybdenum concentrates, and cement (portland and masonry). These accounted for nearly 94% of the State's total nonfuel raw mineral production value. Copper continued to be the State's leading nonfuel mineral in 2006, accounting for 53% of the State's total nonfuel mineral value. Copper has led for 36 of the past 39 years (from 1968 through 2006). Potash (reported as potassium salts prior to 1990) was the State's leading nonfuel mineral in the early 1950s through 1967, in 1982, and in 2002–03.

In 2006, substantial increases in the production values of copper and construction sand and gravel—up by $282 million and $45 million, respectively—led the State's increase in nonfuel mineral production value. As a result of substantial increases in copper prices, the value of production rose by 56% despite a 14% decrease in production. In construction sand and gravel, a 15% increase in production led to a $45 million increase in its total production value. Smaller yet significant increases also took place in cement, up by more than $5 million, and crude gypsum, gold, and salt, up by about $3 million each. The unit values rose in all five mineral commodities. The largest decreases in value took place in potash and molybdenum concentrates, down by about $10 million each, and crushed stone, down by about $2 million (table 1).

In 2006, New Mexico continued to lead the Nation in the quantities of potash, crude perlite, and zeolites produced (descending order of value) and remained third in copper, sixth in molybdenum concentrates, and eighth in silver, as compared with production in other States. The State increased in rank to 8th from 9th in the production of gold and to 10th from 14th in that of crude gypsum, while it decreased in rank to 5th from 4th in pumice and pumicite production. Additionally, New Mexico was a significant producer of construction sand and gravel.

The following narrative information was provided by the New Mexico Bureau of Geology and Mineral Resources[2] (NMBGMR). Production data and information in the text that follows are those reported by the NMBGMR and are based on the agency's own surveys and estimates, data obtained from the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division, mine visits by NMBGMR staff, and cited references. These may differ from some production figures published by the USGS.

Overview and Trends

In 2006, the total nonfuel mineral production value reached a record level, surpassing the previous record level reached in 2005. Higher commodity prices and a continuing increase in production for most commodities increased the value to 75% above the value in 2000 (New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division, 2007b, p. 35).

Mining and exploration activity remained well above pre-2004 levels as most commodity prices rose, consistent with increased demand for minerals worldwide. More than 200 mines, including aggregate quarries, were active in New Mexico in 2006. Comprehensive reclamation plans were in place for nearly all active mining companies, with some conducting reclamation activities at closed mining operations during the year (New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division, 2007a, p. 5). Phelps Dodge Corp. continued reclamation at its Hurley copper smelter that had been closed permanently in 2005. Phelps Dodge also reclaimed about 400 hectares (ha) of land containing copper tailings and rock accumulated from mining operations. In addition, Molycorp Inc. continued a reclamation and revegetation program at its Questa open pit molybdenum mine site. Molybdenum was produced from the open pit portion of the mine during the period 1965 to 1983. Molycorp also completed a geotechnical stability evaluation and failure modes analysis on its accumulated rock piles and began implementing measures to reduce potential hazards associated with these rocks.

Exploration and Development

Galway Resources Ltd. conducted a drilling program northwest of the carbonate-hosted silver deposits in Lone Mountain. Results delineated a weakly mineralized quartz latite to quartz monzonite stock surrounded by an upper copper oxide zone and two deeper, stratiform, copper and lead-zinc skarn bodies, ranging in depth from 30 meters (m) to 915 m (Moran and More, 2006). Galway acquired the Lone Mountain property in late 2006 and planned to continue its drilling program to further evaluate the mineralization on the property (Galway Resources Ltd., 2006).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Virginia T. McLemore, Senior Economic Geologist, authored the State mineral industry information provided by the New Mexico Bureau of Geology and Mineral Resources.

General Minerals Corp. analyzed rock chip samples collected from the Gold Lake copper-molybdenum porphyry deposit in the White Signal District. Results indicated the samples to contain anomalous copper (up to 11.5%), molybdenum (up to 0.17%), silver [up to 385 grams per metric ton (g/t)], and bismuth (up to 2,300 g/t) (G.F. Klemmick, General Minerals Corp., unpub. report, 2006). Additional drilling was planned by General Minerals to further delineate the mineralization and to test the economic potential of the Gold Lake deposit.

The Atlas Minerals Inc. (formerly Toro Mining and Minerals, Inc.) continued to evaluate its Toro perlite deposit northwest of Deming. The Toro site has been estimated to contain 13.6 million metric tons (Mt) of perlite (Atlas Minerals Inc., 2003). St. Cloud Mining Co. continued to examine the production potential of its Thompson Canyon perlite deposit in Grant County.

Several companies continued to explore for gold and silver throughout New Mexico, especially in Catron, Dona Ana, Grant, Lincoln, Rio Arriba, and Socorro Counties. El Capitan Precious Metals, Inc. continued to explore for iron and gold from iron skarns adjacent to the Capitan pluton in Lincoln County.

Commodity Review

Industrial Minerals

Cement, Portland and Masonry.—Portland cement was a principal construction material produced in New Mexico. Masonry cement was also produced for use in mortar and stucco. Several different types of cement were produced at the Tijeras cement plant near Albuquerque operated by Grupos Cementos de Chihuahua (GCC). Production at Tijeras was begun in 1959, and GCC assumed management of its operations in 1994. Limestone required for production of the cement was mined at the Tijeras site. Varying quantities of alumina, gypsum, iron ore, and sandstone/shale material for the cement were obtained from sources throughout New Mexico. The cement shortage that had prevailed in 2005 lessened considerably in 2006, although prices for cement remained near 2005 levels.

Clay.—Common clay and fire clay were mined in New Mexico during the year. Common clay, which typically made up most of the State's production, was used in the manufacture of bricks, quarry tile, and roofing granules. Commercial adobe yards, which produced adobe bricks from local alluvial materials, were located mostly in northern New Mexico. Bricks were also manufactured at Kinney Brick Co's mill in Albuquerque, Bernalillo County, and American Eagle Brick Co's Eagle plant in Sunland Park, Dona Ana County.

Gemstones.—Gemstones and semiprecious stones were produced in New Mexico, including agate, azurite, fluorite, geodes, moonstone, onyx, peridot, smithsonite, and turquoise. Specific production statistics for 1998–2006 are withheld for gemstones and semiprecious stones in New Mexico (proprietary data), in part because many noncommercial collectors do not report their income. In 1993, the value of gemstone production was estimated to be about $22,000, and the average during the previous 5 years was approximately $76,000, mostly from turquoise (Austin, 1995). However, owing to the depletion of identified resources and difficulties and expenses involved in adhering to Federal, State, and local environmental regulations, most of the commercial mines have been closed.

Gypsum.—Centex American Gypsum Co. operated the White Mesa Mine near Cuba, Sandoval County, and two wallboard plants in Albuquerque and Bernalillo Counties. Other smaller gypsum mines were operated in Sandoval and Dona Ana Counties. Gypsum is used primarily in the manufacture of wallboard for homes, offices, and commercial buildings.

Perlite.—In New Mexico, perlite is found in high-silica rhyolite (lava) flows and lava domes that were emplaced typically 3.3 to 7.8 million years ago (Barker and others, 1996; Chamberlin and Barker, 1996). Perlite was produced from three mine and mill operations including Dicaperl Minerals Corp.'s El Grande and Socorro production facilities, and Dicaperl and Harborlite Corp.'s, joint operations at No Agua. Perlite is used in building construction products, horticultural aggregate, fillers, and filter aids.

Potash.—Intrepid Mining LLC and Mosaic Co. operated underground mines in the Carlsbad potash district, the leading potash-producing area in the United States. Potash reserves in the district were estimated to be more than 500 Mt.

The annual production capacity of the Mosaic potash mines is about 500,000 metric tons (t) of red potash and about 1.2 Mt of potassium magnesium sulfate. The total ore reserves at Mosaic include an estimated total of 104 Mt of potash ore in three mining beds ranging in thickness from 1.4 m to 4.5 m. These reserves are estimated to yield 4.5 Mt of concentrate from sylvinite with an average grade of 60% potash (K_2O) and 16.3 Mt of langbeinite concentrate with an average grade of 22% K_2O.

Intrepid Mining NM LLC, the leading potash producer in the United States, processed two types of ore to produce red potash using flotation techniques, and higher-purity white potash using hot-leach crystallization methods. Intrepid's West facility, which consisted of a potash mine and refinery, was originally built in 1929 by U.S. Potash and had an annual production capacity of approximately 490,000 t of red potash. The East facility, which consisted of a potash mine, refinery, and compaction plant, had an annual production capacity of approximately 510,000 t of white potash. A third facility (North) consisted of a granular compaction plant and a structure for storage of products. Intrepid employed about 650 people at these facilities in 2006. Potash is used as fertilizer and as a chemical in specialty and industrial markets.

Pumice and Pumicite.—Copar Pumice Company, Inc. produced pumice from two quarries, the Guaje Canyon Mine and the El Cajete Mine in 2006. Expansion of the El Cajete Mine in the Jemez Mountains was delayed awaiting the preparation of a final environmental impact statement (EIS). A draft EIS had been released in 1997. The mine was opened in 1997 and was expected to be operational for at least 10 years. Reserves at El Cajete were estimated to be about 91,000 t, and were to be used in the stonewashing step for preparation of denim jeans. Pumice and pumicite are also used in the production of concrete and lightweight building blocks, and in applications including abrasives, absorbents, filter aids, and horticultural materials. A total of five pumice producing operations were active in the Jemez Mountains and Mogollon-Datil regions of the State during the year.

Salt.—United Salt Corp. operated a solar evaporation salt plant near Carlsbad in 2006. United harvested the salt from a 1,050-ha salt lake after the sun had evaporated the water from the brine. Following thorough washing, the salt was packaged for use in agricultural feed products, for chemical feed stocks, for swimming pool chlorine generation, and for water conditioning. Originally, the salt produced at Carlsbad was sold as deicing salt for roads.

Zeolites.—St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operated the largest zeolite mine in the United States at the Stone House Mine in Sierra County. St. Cloud has operated the open pit mine since 1993. Its mining properties at Stone House contain 16.6 Mt of reserves (St. Cloud Mining Co., 2007). The zeolites mined at Stone House are found predominantly as the clinoptilolite mineral in altered tertiary tuff, which is crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. St. Cloud recently made several modifications to its zeolite operation, including the addition of cation exchange capacity for added value products and additional classification capabilities to expand markets for their products. The modern facility has the crushing and sizing capacity of about 450 metric tons per day. Clinoptilolite has unique chemical, physical, and cation exchange properties that can be used advantageously in agricultural, environmental, and industrial applications. Markets include animal feed supplements, air filtration media, cation exchanged products, environmental products, filtration media, floor-drying agents, industrial fillers and absorbents, mineral fillers, odor control and hygiene products (cat litter), soil conditioners, and water and wastewater treatment.

Other industrial minerals.—Humate, a weathered coal or highly organic mudstone that is found in the coal-bearing sequences, was recovered from five mining facilities in New Mexico during the year. Horizon Ag Products Inc. and Menefee Mining Corp. each operated a mine and mill near Cuba. U-Mate International, Inc. mined and processed ore at its facilities in the Gallup area. In addition, mining was carried out at the Eagle Mesa Mine near Cuba and the Morningstar Mine in San Juan County. Significant humate deposits are found in the Fruitland and Menefee formations in the eastern San Juan Basin. Approximately 11 billion metric tons of humate resources was reported to be within the State, most of which are in the San Juan Basin (Hoffman and others, 1996). Humate is used as a soil conditioner and as an additive for oil and gas drilling muds.

Small flagstone dimension stone operations were located throughout New Mexico that produced sandstone, travertine, and other ornamental rock. The largest was New Mexico Travertine, Inc., a fully integrated stone processing plant, located south of Albuquerque, near Belen.

Helium was produced from the Shiprock and Ute Dome fields in the San Juan Basin. The uses for helium included controlled atmospheres, cryogenic applications, gas mixtures, leak detection, pressurizing and purging, welding cover gas, and other uses.

Magnetite was shipped by Phelps Dodge Corp. from the stockpiles at Cobre Mining Co.'s Continental Mine and used in cement production and other minor uses.

Although garnet was not produced in New Mexico during the period 1998 through 2006, at least one company was examining areas in the State for potential resources that could be used as abrasives. Garnet typically is found in skarn deposits in southern and central New Mexico and in some areas, garnet is a major constituent of waste rock piles remaining after recovery of metals (Lueth, 1996).

Metals

Copper.—Phelps Dodge continued to produce copper at the Chino Mine near Santa Rita as well as the Tyrone Mine in the Burro Mountains. Freeport-McMoRan Copper & Gold Inc. and Phelps Dodge signed a definitive merger agreement in November 2006, under which Freeport-McMoRan would acquire Phelps Dodge, creating the world's leading publicly traded copper company (Freeport-McMoRan Copper & Gold Inc., 2006). In 2006, Phelps Dodge produced 48,000 t of copper concentrate and 36,000 t of copper by solvent extraction/electrowinning (SX/EW) at the Chino operation. The Chino Mine is the largest developed porphyry copper deposit in New Mexico. Estimated milling reserves in 2006 were 48.9 Mt containing 0.68% copper, and estimated leaching reserves were 109.3 Mt containing 0.43% copper (Phelps Dodge Corporation, 2007). Phelps Dodge continued reclamation of the inactive areas of the Chino Mine during the year.

In 2006, copper production from the Tyrone Mine was carried out exclusively using leaching and SX/EW and has been using these methods since 1992 when the concentrator at Tyrone was closed permanently. Approximately 28,800 t of electrowon copper was produced during the year. Estimated leaching reserves at Tyrone were 73.4 Mt grading 0.36% copper (Phelps Dodge Corporation, 2007). The Tyrone porphyry copper deposit is found within a quartz monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, sometimes considered separate porphyry copper deposits, also have been found at Tyrone.

Phelps Dodge's Cobre mining operations (Continental Mine), acquired from Cobre Mining Co., Inc. in 1998, remained on care-and-maintenance status in 2006. The Cobre operation includes an open pit mine, two underground mines, and two mills. The deposit consists of a porphyry copper deposit and adjacent skarn deposits. Estimated leaching reserves were 123.6 Mt grading 0.21% copper (Phelps Dodge Corporation, 2007). Most of the copper reserves at the Cobre Mine are in the limestones of the Syrena formation and the upper part of the Lake Valley limestone deposits north of the Barringer fault.

Gold and Silver.—In 2006, all gold and silver production in New Mexico was as byproduct recovered from copper milling by Freeport-McMoRan Copper & Gold Inc. However, in May 2006, Azco Mining Inc. (now Santa Fe Gold Corp.) acquired the Summit silver-gold property in the Steeple Rock District, Grant County, and initiated steps to develop a mining operation at the site (Azco Mining Inc., 2006a). The company purchased a ball mill and flotation plant in Lordsburg to process the Summit ore and engaged an engineering firm to conduct studies on the feasibility of operating the mine (Azco Mining Inc., 2006b). Santa Fe also owns mineral lease rights to the Ortiz gold property in north central New Mexico that is thought to contain as much as 62,000 kilograms (2 million troy ounces) of gold (Santa Fe Gold Corp., 2007).

Molybdenum.—Molycorp Inc. (a subsidiary of Unocal Corp., now owned by Chevron Inc.) operated the underground Questa Mine in Taos County during the year. A block caving method was used to mine the molybdenite ore. Resources at Questa were estimated to be about 60 Mt, based upon data obtained in 1999. Current ore grades range between 0.3% and 0.5% molybdenum. Approximately 200 people were employed at the Questa mining operation in 2006. In addition to the Molycorp operation, molybdenum is also produced as byproduct concentrate at Phelps Dodge's Chino copper concentrator in Grant County. Total production of molybdenum for the two operations was about 1,800 t in 2006.

Molybdenum is a refractory metallic element used principally as an alloying agent in cast iron, steel, and superalloys to enhance hardness, strength, toughness, and wear and corrosion resistance. Molybdenum is used in numerous chemical applications, including catalysts, lubricants, and pigments.

Galway Resources Ltd. announced resource information for its Victorio Mountains molybdenum-tungsten deposit in Luna County. Indicated resources were estimated to be about 19.5 Mt grading 0.15% molybdenum and 0.13% tungsten oxide (WO_3). Inferred resources were estimated to be about 10.6 Mt grading 0.13% molybdenum and 0.14% WO_3 (Galway Resources Ltd., 2007, p. 29–32). The Victorio Mountains deposit consists of molybdenum, tungsten, and beryllium skarns and carbonate hosted deposits that are associated with a Tertiary intrusion (McLemore and others, 2000, p. 267).

Award

GCC Rio Grande Portland Cement Inc. won an Excellence in Reclamation Award in 2006 from the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department. GCC Rio Grande used computer software, historic weather data, and a global positioning system to help form the soil into a natural shape that would reduce soil erosion for a more effective reclamation of closed limestone quarries.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2004		2005		2006	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, common		34	177	36	221	35	228
Copper[3]		122	362,000	131	502,000	113	784,000
Gemstones		NA	20	NA	19	NA	23
Helium (Grade–A)	million cubic meters	W	W	--	--	W	W
Sand and gravel:							
Construction		13,600	89,500	16,000	112,000	18,400	157,000
Industrial		--	--	113	W	W	W
Silver[3]	kilograms	3,570	767	6,390	1,510	W	W
Stone:							
Crushed		2,830 [4]	16,400 [4]	3,750 [r]	25,400 [r]	3,510	23,200
Dimension		57	2,430	7	279	W	W
Combined values of cement, gold, gypsum (crude), lime, mica [crude (2004)], molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, stone [crushed granite (2004)], zeolites, and values indicated by the symbol W		XX	397,000	XX	513,000	XX	509,000
Total		XX	868,000	XX	1,150,000	XX	1,470,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.Withheld values included in "Combined value" data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Recoverable content of ores, etc.

[4] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	13 [r]	2,360 [r]	$14,500 [r]	17	1,960	$12,000
Granite	1	W	W	1	W	W
Sandstone	1	W	W	1	W	W
Volcanic cinder and scoria	9	338	2,620	5	254	2,290
Miscellaneous stone	6 [r]	871 [r]	6,460 [r]	15	1,190	7,980
Total	XX	3,750 [r]	25,400 [r]	XX	3,510	23,200

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregate	2	11
Coarse aggregate graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	344	1,100
Fine aggregate (-⅜ inch):		
Stone sand, concrete	147	1,150
Screening, undesignated	150	1,340
Coarse and fine aggregates:		
Graded road base or subbase	343	3,030
Crusher run or fill or waste	5	30
Other coarse and fine aggregates	104	1,310
Other construction materials	40	361
Chemical and metallurgical, cement manufacture	W	W
Other miscellaneous uses and specified uses not listed	W	W
Unspecified:[2]		
Reported	232	1,630
Estimated	1,100	7,300
Total	1,360	8,910
Grand total	3,510	23,200

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	17	140	280	2,360	--	--
Coarse and fine aggregate[5]	136	1,600	316	2,770	--	--
Other construction materials	--	--	40	361	--	--
Chemical and metallurgical[6]	W	W	--	--	--	--
Other miscellaneous uses	--	--	W	W	--	--
Unspecified[7]						
Reported	138	996	25	169	69	467
Estimated	610	4,000	510	3,300	--	--
Total	1,930	10,800	1,510	11,900	69	467

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4] Includes screening (undesignated) and stone sand (concrete).

[5] Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6] Includes cement manufacture.

[7] Reported and estimated production without a breakdown by end use.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,140	$18,700	$8.74
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	202	1,660	8.19
Asphaltic concrete aggregates and other bituminous mixtures	2,680	31,200	11.68
Road base and coverings[3]	2,230	15,800	7.11
Fill	884	5,260	5.95
Other miscellaneous uses[4]	524	11,400	21.72
Unspecified:[5]			
Reported	2,100	7,260	3.46
Estimated	7,690	65,600	8.53
Total or average	18,400	157,000	8.51

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (lime).

[4] Includes railroad ballast.

[5] Reported and estimated production without a breakdown by end use.

TABLE 6

NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,170	10,800	964	7,880	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	136	1,200	66	456	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,950	18,600	503	11,700	224	988
Road base and coverings[3]	1,460	10,700	718	4,900	45	250
Fill	610	4,640	274	625	--	--
Other miscellaneous uses[4]	471	10,800	53	619	--	--
Unspecified:[5]					--	--
Reported	598	3,590	105	980	1,400	2,700
Estimated	5,680	48,600	2,010	17,000	--	--
Total	12,100	109,000	4,690	44,100	1,670	3,930

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

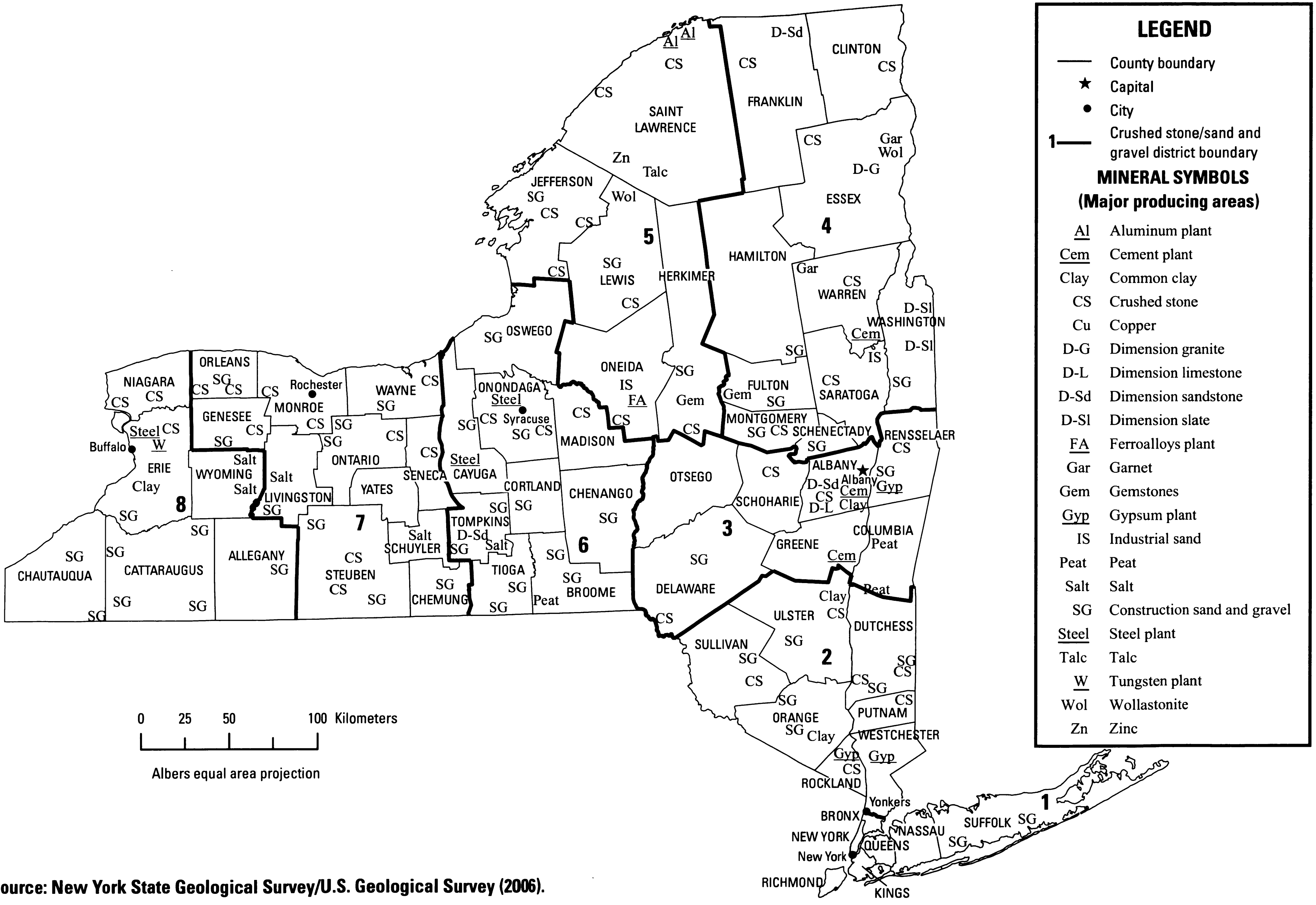
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (lime).

[4] Includes railroad ballast.

[5] Reported and estimated production without a breakdown by end use.

NEW YORK



Source: New York State Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NEW YORK

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New York State Geological Survey for collecting information on all nonfuel minerals.

In 2006, New York's nonfuel raw mineral production[1] was valued at $1.33 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $40 million, or 3%, increase from the total value for 2005, which was up by $200 million, or 18.3%, from 2004 to 2005. The State was 17th in rank (15th in 2005) among the 50 States in total nonfuel mineral production value, of which the State accounted for 2% of the U.S. total value.

In 2006, crushed stone, by value, remained New York's leading nonfuel mineral, followed by cement (portland and masonry), salt, construction sand and gravel, zinc, and wollastonite. These six mineral commodities accounted for nearly 97% of the State's total nonfuel mineral production value. Cement (portland and masonry) led New York's increase in value; a small increase in production and a moderate increase in unit value generated a nearly $50 million increase in the mineral commodity's total production value. This was followed by increases in the production values of construction sand and gravel, zinc, common clays, peat, and wollastonite, in descending order of change. Construction sand and gravel value was up by $32 million, and the value of common clays was up by nearly $19 million. The production values and increases in those values from 2005 to 2006 for zinc (no production in 2005), peat, and wollastonite are withheld because these are individual company proprietary data. The largest decreases in value took place in the production of salt, crushed stone, crude gypsum, and dimension stone, down by $70 million, $12 million, $9.3 million, and nearly $4 million, respectively (table 1).

In 2006, New York continued to be the only State to produce wollastonite. The State was first in the quantity of industrial garnet produced of three producing States, third in the production of salt, and fourth in that of talc. The State rose to 3d in peat production with a very significant increase in production from years past; to 4th in the production of zinc, with the first resumption of mining since when the metal was last produced in 2001, and to 10th in common clays. The State decreased to 9th from 8th in dimension stone production. Additionally, mining and mineral processing operations produced significant quantities of, in descending order of value, crushed stone (14th in rank), portland cement (12th), construction sand and gravel (13th), and masonry cement (12th). Primary aluminum and raw steel were produced from materials obtained from foreign, and other domestic sources. In 2006, with a small decrease in production, the State ranked sixth (fourth in 2005) in primary aluminum production among 11 producing States.

The following narrative information was provided by the New York State Geological Survey[2] (NYSGS) and the Division of Mineral Resources (DMR) of the New York State Department of Environmental Conservation (DEC). Continuing the trend of the past few years, the number of permitted nonfuel mineral mining operations in New York was lower in 2006 than the previous year, numbering 2,215. There were 56 active mines in New York's 63 counties. Of the 2,215 active mining operations, 1,739 were operated by industry and 476 by local or State government entities. These totals cover only mines regulated by the Mined Land Reclamation Law. New York has many unregulated mines, both active and abandoned that fall outside the law's jurisdiction. Most of these are small operations or mines that predate the 1975 law. The vast majority of the permitted mines produce sand and gravel or other surficial deposits. However, approximately 250 hardrock mines produced materials ranging from carbonate rock, garnet, salt, shale, talc and wollastonite. Most of the hardrock mines are surface quarries producing carbonate rock, but there are a few permitted underground mines. The most commonly mined commodities were 1,838 mineral operations for sand and gravel, 100 for limestone, 64 for bluestone, and 21 for sandstone.

Environmental Issues and Mine Reclamation

In the aftermath of the AKZO Inc. Restoff salt mine failure, a desalinization plant was constructed in Livingston County, and began operations in 2006. The purpose of the plant is to stabilize the level of salt-contaminated ground water rising in the area of the mine collapse. The AKZO Brine Mitigation Project states that this will prevent the salty water from mixing with and degrading the quality of the ground water in the bedrock and surficial aquifers. Salt water levels have been rising because of the slow closure of the flooded mine. This is taking place because mine space reduction forces salt water up the collapsed area and into the overlying aquifer. Salt from the desalinization plant will be pelletized and marketed for use in water softeners. The purified water will augment the drinking water supply of the local community.

A total of nearly 403 hectares (ha) (997 acres) of mined land were reclaimed in 2006. The Mined Land Reclamation Program holds $122 million in financial security to guarantee mine reclamation. In 2006, DEC approved reclamation on 232 ha

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] William Kelly, State Geologist of New York, authored the text of the State mineral industry information provided by the New York State Geological Survey (a bureau of the New York State Museum in the State Education Department), Division of Research and Collections in collaboration with the New York State Department of Environmental Conservation, Division of Mineral Resources.

(574 acres) at 78 operating mines and final reclamation on 175 ha (432 acres) at 68 closed mines. A total of 10,400 ha (25,600 acres) of mined land have been reclaimed since the inception of the program in 1975.

Government Programs

In 2006, DEC collected $2.7 million in annual regulatory fees from industry and State-owned mines. Mines owned by other governmental entities are exempt from these fees. A total of 327 permits were issued by the DEC in 2006. Of these, 47 were for new operations, and 327 were either renewals or modifications. A breakdown of the new permits and the commodities is: sand and gravel (31), topsoil (5), bluestone (3), granite (crushed) (3), limestone (3), peat (1), and shale (1). A total of 19,500 ha (48,200 acres) were affected by mining in 2006 out of a total life-of-mine approved area of 46,600 ha (115,000 acres). In 2006, only seven of 62 counties had more than 0.30% of their land surface under mining permit (range is 0.36% to 0.41%). Most counties with active mines have less than 0.25% of the surface affected by mining. Permitted new mines tended to be smaller in 2006. Nearly 70% of new mines permitted was 4 ha (10 acres) or less in size. The trend towards smaller mines represents a reversal from the larger mines permitted in the past. For the first half of the last decade, the number of large mines increased, and the number of small mines decreased reflecting the challenges in permitting green field operations. Expanding or deepening an existing mine was sometimes easier than opening a new mine.

The NYSGS continued bedrock and surficial geologic mapping projects in several regions of the State. Mapping priority was given to areas with expanding development surrounding urban areas and along transportation corridors with a need for an understanding of mineral resources, among other topics. The NYSGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Maps were produced at a scale of 1:24,000. In 2006, digital maps of three 7 ½-minute quadrangles were produced in New York. These included the town of Camillus surficial geologic map, the Maybrook Village bedrock map, and the Croton Falls Hamlet surficial map. Using ground-penetrating radar, the NYSGS mapped a French and Indian War fortification in Ogdensburg, NY, along the St. Lawrence River. The work was performed for archaeological staff of the New York State Museum. Subsequent excavation revealed many period artifacts.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW YORK[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	756	10,900	785	11,700	813	30,400
Gemstones, natural	NA	74	NA	78	NA	90
Gypsum, crude	--	--	2,230	11,400	413	2,120
Salt	6,430	301,000	6,840	327,000	6,090	257,000
Sand and gravel, construction	33,100	189,000	31,300	204,000	35,000	236,000
Stone:						
Crushed	49,400	327,000	52,600 r	447,000 r	52,100	435,000
Dimension	44	4,560	42	7,470	39	3,860
Combined values of cement, garnet (industrial), peat, sand and gravel [industrial (2004, 2006)], talc (crude), wollastonite, zinc	XX	256,000	XX	286,000	XX	368,000
Total	XX	1,090,000	XX	1,290,000	XX	1,330,000

r Revised. NA Not available. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

NEW YORK: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	59	31,600 [r]	$267,000	56	29,200	$238,000
Dolomite	14	10,200	86,500	13	10,900	91,100
Marble	1	W	W	1	W	W
Granite	7	3,540	28,400	9	3,800	31,400
Traprock	2	W	W	2	W	W
Sandstone	12	2,410 [r]	23,000 [r]	10	2,850	28,100
Slate	1	90	737	1	88	736
Miscellaneous stone	7 [r]	445 [r]	3,540 [r]	7	515	4,290
Total	XX	52,600 [r]	447,000 [r]	XX	52,100	435,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	67	940
Riprap and jetty stone	401	4,430
Filter stone	16	134
Other coarse aggregate	274	3,440
Total	758	8,940
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,630	13,600
Bituminous aggregate, coarse	1,900	15,000
Bituminous surface-treatment aggregate	825	6,630
Railroad ballast	W	W
Other graded coarse aggregate	1,960	20,300
Total	6,320	55,500
Fine aggregate (-⅜ inch):		
Stone sand, concrete	132	928
Stone sand, bituminous mix or seal	821	6,630
Screening, undesignated	143	916
Other fine aggregate	1,260	14,800
Total	2,360	23,300
Coarse and fine aggregates:		
Graded road base or subbase	2,960	19,500
Unpaved road surfacing	(2)	(2)
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	3,050	21,100
Other coarse and fine aggregates	2,910	24,000
Total	8,930	64,800
Other construction materials[3]	710	5,980
Agricultural, limestone	(4)	(4)
Other miscellaneous uses and specified uses not listed	(4)	(4)
Unspecified:[5]		
Reported	15,700	131,000
Estimated	17,000	140,000
Total	32,900	276,000
Grand total	52,100	435,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Includes drain fields.

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		Districts 3 and 4[3]		Districts 5 and 6[3]	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[4]	207	2,850	356	3,960	98	1,050
Coarse aggregate, graded[5]	W	W	2,530	20,900	1,840	14,000
Fine aggregate (-⅜ inch)[6]	W	W	W	W	723	6,120
Coarse and fine aggregate[7]	685	8,110	2,380	18,800	2,390	14,200
Other construction materials[8]	--	--	404	3,370	73	211
Agricultural[9]	--	--	W	W	W	W
Other miscellaneous uses and specified uses not listed	--	--	--	--	W	W
Unspecified:[10]						
Reported	10,500	87,400	305	2,530	1,980	16,500
Estimated	3,100	26,000	6,900	57,000	3,600	32,000
Total	15,600	139,000	13,800	116,000	10,700	84,100

Use	Districts 7 and 8[3]	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[4]	98	1,080
Coarse'aggregate, graded[5]	W	W
Fine aggregate (-⅜ inch)[6]	W	W
Coarse and fine aggregate[7]	3,470	23,700
Other construction materials[8]	233	2,400
Agricultural[9]	W	W
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[10]		
Reported	2,920	24,200
Estimated	3,600	30,000
Total	12,000	95,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 1.

[3] Districts 3 and 4, 5 and 6, and 7 and 8 are combined to avoid disclosing company proprietary data.

[4] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[5] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[6] Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[7] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[8] Includes drain fields.

[9] Includes agricultural limestone.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,290	$40,400	$7.65
Plaster and gunite sands	205	1,750	8.55
Concrete products (blocks, bricks, pipe, decorative, etc.)	114	893	7.83
Asphaltic concrete aggregates and other bituminous mixtures	1,720	12,600	7.32
Road base and coverings	4,610	23,500	5.09
Road stabilization (cement)	395	2,720	6.88
Road stabilization (lime)	39	106	2.72
Fill	1,890	8,410	4.46
Snow and ice control	1,090	5,720	5.25
Railroad ballast	68	435	6.40
Filtration	104	1,030	9.87
Other miscellaneous uses	107	1,180	11.05
Unspecified:[2]			
Reported	3,440	32,300	9.39
Estimated	15,900	105,000	6.60
Total or average	35,000	236,000	6.75

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
Concrete aggregates and concrete products[2]	1,370	11,200	497	6,280	548	4,680
Asphaltic concrete aggregates and road base material	W	W	W	W	1,750	11,200
Fill	177	1,550	112	701	620	2,280
Snow and ice control	W	W	127	1,400	225	1,250
Other miscellaneous uses[3]	34	420	190	2,730	78	466
Unspecified:[4]						
Reported	1,530	17,000	286	4,130	28	210
Estimated	1,130	7,560	2,380	15,800	769	5,090
Total	4,240	37,700	3,590	31,000	4,020	25,200

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	563	2,700	360	2,010	807	5,960
Asphaltic concrete aggregates and road base materials	427	1,740	390	2,350	2,170	9,660
Fill	292	952	151	576	279	1,160
Snow and ice control	W	W	187	790	154	566
Other miscellaneous uses[3]	268	1,150	--	--	143	1,120
Unspecified:[4]						
Reported	140	616	122	832	201	1,600
Estimated	1,070	7,070	990	6,550	2,780	18,500
Total	2,760	14,200	2,200	13,100	6,530	38,500

	District 7		District 8	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	723	5,100	736	5,140
Asphaltic concrete aggregates and road base materials	1,130	6,600	728	5,160
Fill	99	422	156	763
Snow and ice control	W	W	24	94
Other miscellaneous uses[3]	105	499	--	--
Unspecified:[4]				
Reported	1,130	7,920	4	26
Estimated	3,690	24,300	3,100	20,000
Total	6,880	44,800	4,740	31,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

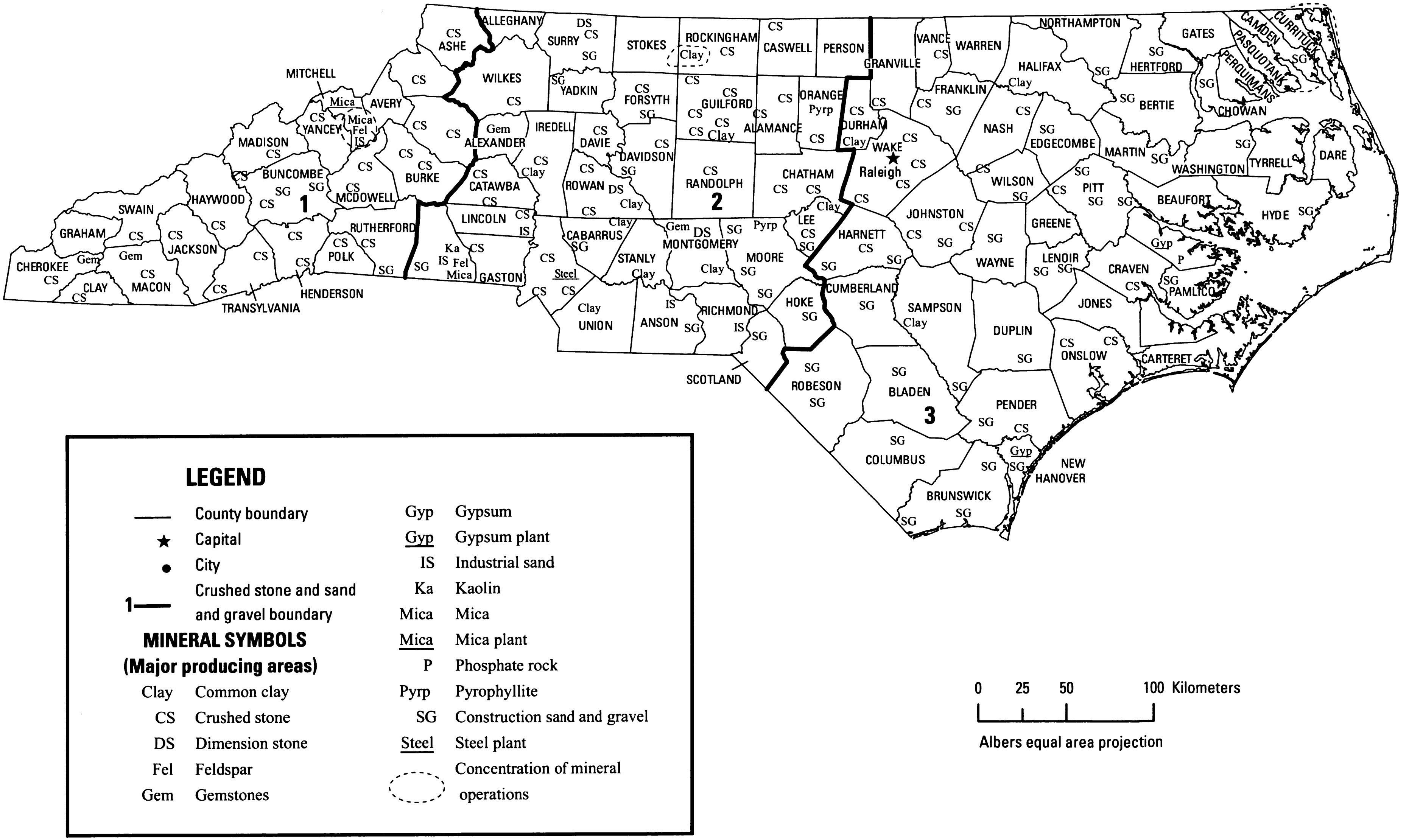
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration and railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

NORTH CAROLINA



Source: North Carolina Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2006, North Carolina's nonfuel raw mineral production[1] was valued at $1.02 billion,[2] based upon annual U.S. Geological Survey (USGS) data. This was a $158 million, or more than 18%, increase from the State's total nonfuel mineral value of $862 million in 2005, which was up $57 million, or 7%, from that of 2004. North Carolina rose to 22d[2] from 25th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 1.5% of the U.S. total.

Crushed stone remained North Carolina's leading nonfuel raw mineral in 2006, accounting for nearly 84% of the State's total value of nonfuel mineral production (in particular, excluding that of phosphate rock[2]). It was followed (in descending order of value) by phosphate rock, construction sand and gravel, industrial sand and gravel, common clays, feldspar, dimension stone, and mica (crude). The largest increases in value for the year were in crushed stone, up $144 million, and in common clays, up more than $10 million. The increase in crushed stone value was the largest and most obvious increase supporting the State's increase in nonfuel mineral value, but the increase in the unit value of common clays was also very significant. While the unit value of crushed stone was up slightly more than 14%, that of common clays was up a substantial 62%. Smaller yet significant increases in value also took place in the values of construction sand and gravel, (up by about $6 million), crude mica (up by more than $2 million), and phosphate rock (withheld—company proprietary data). The mineral commodity with the largest decrease in value (down by $4.5 million) was industrial sand and gravel; although production was up about 6%, its value of production was down by about 15% (table 1).

In 2005, North Carolina continued to be the only State that produced pyrophyllite; to lead the Nation in the quantities of feldspar and mica produced; to be 2d of four phosphate rock-producing States; and to be 10th in industrial sand and gravel production. North Carolina increased in State production ranking in several mineral commodities. The State rose to 2d from 3d in the production of common clays, to 6th from 9th in crushed stone, to 7th from 10th in dimension stone, and to 10th from 11th in gemstones (gemstones based upon value). Additionally, significant quantities of construction sand and gravel were produced in North Carolina. Metal production in the State, especially that of raw steel, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources.

The following narrative information was provided by the North Carolina Geological Survey[3] (NCGS).

Commodity Review

Industrial Minerals

Sand and Gravel, Industrial.—Split-spoon samples of six drill cores obtained from the Pinehurst Formation, Richmond County, NC, were evaluated for glass sand raw material potential. Laboratory analyses results of the samples, recovered at a depth of 18 meters from within 1,130 hectares (ha) of the Pinehurst Formation, were documented in NCGS Circular 33, "Suitability of Pinehurst Formation as a glass sand, Richmond County, North Carolina." Commercial glass sand had been produced previously from a nearby site at the Pinehurst Formation. After attrition scrubbing, sizing, and magnetic separation treatments, this glass sand product had been shown to contain 0.13% to 0.16 % aluminum oxide, 0.02% to 0.04% iron oxide, < 0.01% to 0.02% titanium oxide, and traces of other minor impurities. With this level of impurities, it was considered to be well within the specifications for typical glass sand and suitable for many glass sand applications. Studies to further reduce the impurity levels in the Pinehurst Formation sand were planned that included the use of flotation as an additional separation process.

Environmental Issues

Landslide mapping was completed for Macon County during the year. The prepared maps illustrating high-risk, geologic-hazard area locations were presented to county officials. Further mapping was initiated in the western North Carolina counties of Buncombe and Watauga during the year. The NCGS landslide mapping program also responded to numerous requests from local government officials for assistance in evaluating potentially dangerous slope stability situations. Presentations by members of the program were delivered to public interest groups, the local government, and developers in order to further educate interested parties as to the existence of geologic-hazard areas.

Geologic hazard-related studies also were undertaken at Cape Hatteras National Seashore in cooperation with the North Carolina Division of Emergency Management to identify areas vulnerable to overwash from coastal storms. A geological map,

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] The State's actual total nonfuel mineral values for 2005-06 were substantially higher than those reported in table 1, from which specific production values for phosphate rock, pyrophyllite (crude), and stone [crushed quartzite (2005)] were withheld so as to conceal company proprietary data. If these data were included in the State's total value, North Carolina would rank 21st among the 50 States in total nonfuel mineral production value.

[3] Jeffrey C. Reid, Senior Geologist, minerals and Geographic Information Systems, authored the text for the State mineral industry information provided by the North Carolina Geological Survey.

including geologic hazards, was completed for the southern segment of the Blue Ridge Parkway and Carl Sandberg home in a GIS format for the National Park Service.

Legislation and Government Programs

Outreach

The Aurora Fossil Museum opened a new learning center near its main museum location, thereby expanding its exhibit area. The learning center contains a small lending library and a collection of fossils, minerals, and rocks. Additional information about the museum can be obtained at http://www.aurorafossilmuseum.com. The 13th Annual Fossil Festival was held in Aurora in May.

The National Association of Geoscience Teachers, the NCGS, and the North Carolina Mining Commission, cosponsors of the Outstanding Earth Science Teacher (OEST) Award, presented a Middle Creek High School teacher with the 2006 award. The OEST Award was presented at the North Carolina State Science Teachers' Association meeting in Greensboro, where about 1,500 teachers received rock and mineral specimens and other earth science classroom teaching resources.

The NCGS hosted the 42d Forum on the Geology of Industrial Minerals in Asheville in May. The meeting included two and one-half days of presentations on industrial minerals. Nine field trips showcased North Carolina's geology and industrial minerals. The meeting was attended by more than 200 people from 25 States and 9 foreign countries. Proceedings of the meeting were published as NCGS Information Circular 34.

Geologic Mapping

The NCGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the NCGS completed several geologic maps in western North Carolina and in the Piedmont under the STATEMAP program. The NCGS also established an online map viewer that is available at http://wfs.enr.state.nc.us/NCGeologicMaps/. The online map viewer accesses scanned and georeferenced geologic maps prepared under the STATEMAP program which are included in the inventory of the National Geologic Map Data Base (http://ngmdb.usgs.gov/).

Mining

The Mining Program of the NCGS, Division of Land Resources, reviewed 304 applications to open, modify, renew, or release mines in 2006. Several of the applications required analysis of hydrogeology, blasting, endangered species or erosion, and sedimentation control. Public hearings were held on four applications for mining permits. By yearend, nearly 900 mines were permitted, affecting about 15,800 ha of land. During the year, 415 ha of land was reclaimed and released for other uses.

Minerals Research

The Minerals Research Laboratory (MRL), Asheville, a unit of North Carolina State University, began offering, for the first time in its 60-year history, a course on separation technology. The course covers the basic principles of ore dressing and is being taught at the University of North Carolina at Asheville.

The MRL began the formation of an Advisory Council whose duties would be to prioritize minerals related programs within the State in order to generate more economic development in both the mining and manufacturing sectors. The initial emphasis would be directed toward commercialization of new mineral resources not currently mined in the State, and utilization of industry tailings for new product applications. Council membership was to be derived from various State regulatory departments and experienced mineral marketing individuals, as well as industry engineers and scientists.

Current research efforts at MRL span several States and foreign countries where its focus has been to develop mineral resources used in the abrasive, ceramic, drilling, and plastic industries. Details on the MRL's activities can be accessed at http://www.engr.ncsu.edu/mrl/.

Other

The NCGS initiated a 2-year project funded by the North Carolina Department of Transportation to delineate sand resources offshore at Hatteras and Ocracoke Islands for use as either beach replenishment or inlet fill material. Related coastal sand studies included the collecting and analyzing of data from 18 cores drilled using a rotasonic method. These studies were conducted off the Outer Banks extending between Corolla and Ocracoke Island.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	2,260	12,900	2,180	13,900	2,340	24,200
Kaolin	34	764	27	593	26	950
Feldspar	351	20,500	351	19,000	362	19,100
Gemstones, natural	NA	280	NA	280	NA	282
Mica, crude	40	9,600	39	10,200	57	12,600
Sand and gravel:						
Construction	11,500	59,700	12,000	63,900	12,900	70,000
Industrial	1,630	29,000	1,150	29,200	1,220	24,700
Stone:						
Crushed	72,300	549,000	73,600 [r, 3]	708,000 [r, 3]	77,500	852,000
Dimension	43	18,200	39	17,000	41	17,800
Combined values of olivine (2004), phosphate rock, pyrophyllite (crude), stone [crushed quartzite (2005)]	XX	105,000	XX	(4)	XX	(4)
Total	XX	805,000	XX	862,000 [r]	XX	1,020,000

[r] Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

[4] Value excluded to avoid disclosing company proprietary data.

TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	11	6,790	$66,900 [r]	12	8,480	$90,200
Dolomite	1	369	3,630	1	436	4,970
Granite	74	53,900	526,000 [r]	79	57,400	632,000
Traprock	7	7,690	64,100 [r]	7	7,900	91,000
Quartzite	2	W	W	--	--	--
Slate	2	1,350	13,300 [r]	2	1,440	15,100
Miscellaneous stone	4	3,460	34,400 [r]	3	1,840	18,700
Total	XX	73,600 [r]	708,000 [r]	XX	77,500	852,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	287	3,860
Filter stone	293	4,120
Other coarse aggregate	647	9,950
Total	1,230	17,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,360	27,300
Bituminous aggregate, coarse	522	5,780
Bituminous surface-treatment aggregate	W	W
Railroad ballast	1,480	11,600
Other graded coarse aggregate	7,860	106,000
Total	12,200	151,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	97	1,290
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	849	9,440
Other fine aggregate	2,910	28,300
Total	3,850	39,000
Coarse and fine aggregates:		
Graded road base or subbase	2,900	31,700
Unpaved road surfacing	(3)	(3)
Terrazzo and exposed aggregate	(3)	(3)
Crusher run or fill or waste	1,450	13,800
Other coarse and fine aggregates	9,390	95,900
Total	13,900	144,000
Agricultural, other	(4)	(4)
Special, Whiting or whiting substitute	(4)	(4)
Unspecified:[5]		
Reported	39,400	421,000
Estimated	6,900	78,000
Total	46,300	500,000
Grand total	77,500	852,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[3] Withheld to avoid disclosing company proprietary data; included in "Total."

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	--	--	--	--	W	W
Special[7]	W	W	--	--	--	--
Unspecified:[8]						
Reported	1,140	12,100	20,100	213,000	18,100	196,000
Estimated	4,100	46,000	1,500	17,000	1,300	15,000
Total	14,000	159,000	38,200	413,000	25,300	280,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes other agricultural uses.

[7] Includes whiting or whiting substitute.

[8] Reported and estimated production without a breakdown by end use.

TABLE 5

NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,280	$29,800	$5.65
Plaster and gunite sands	189	969	5.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	374	2,930	7.83
Asphaltic concrete aggregates and other bituminous mixtures	408	2,690	6.60
Road base and coverings[2]	790	4,320	5.47
Fill	2,060	6,650	3.23
Snow and ice control	51	590	11.57
Other miscellaneous uses[3]	334	2,930	8.78
Unspecified:[4]			
Reported	1,080	6,720	6.25
Estimated	2,340	12,300	5.28
Total or average	12,900	70,000	5.42

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Includes filtration.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	2,290	14,400	3,530	19,100	25	258
Asphaltic concrete aggregates and road base materials[4]	570	4,910	629	2,100	--	--
Fill	39	166	1,900	5,830	121	649
Other miscellaneous uses[5]	97	1,020	288	2,510	--	--
Unspecified:[6]						
Reported	463	3,440	613	3,280	--	--
Estimated	558	3,010	1,780	9,320	--	--
Total	4,020	26,900	8,740	42,100	146	907

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 are combined to avoid disclosing company proprietary data.

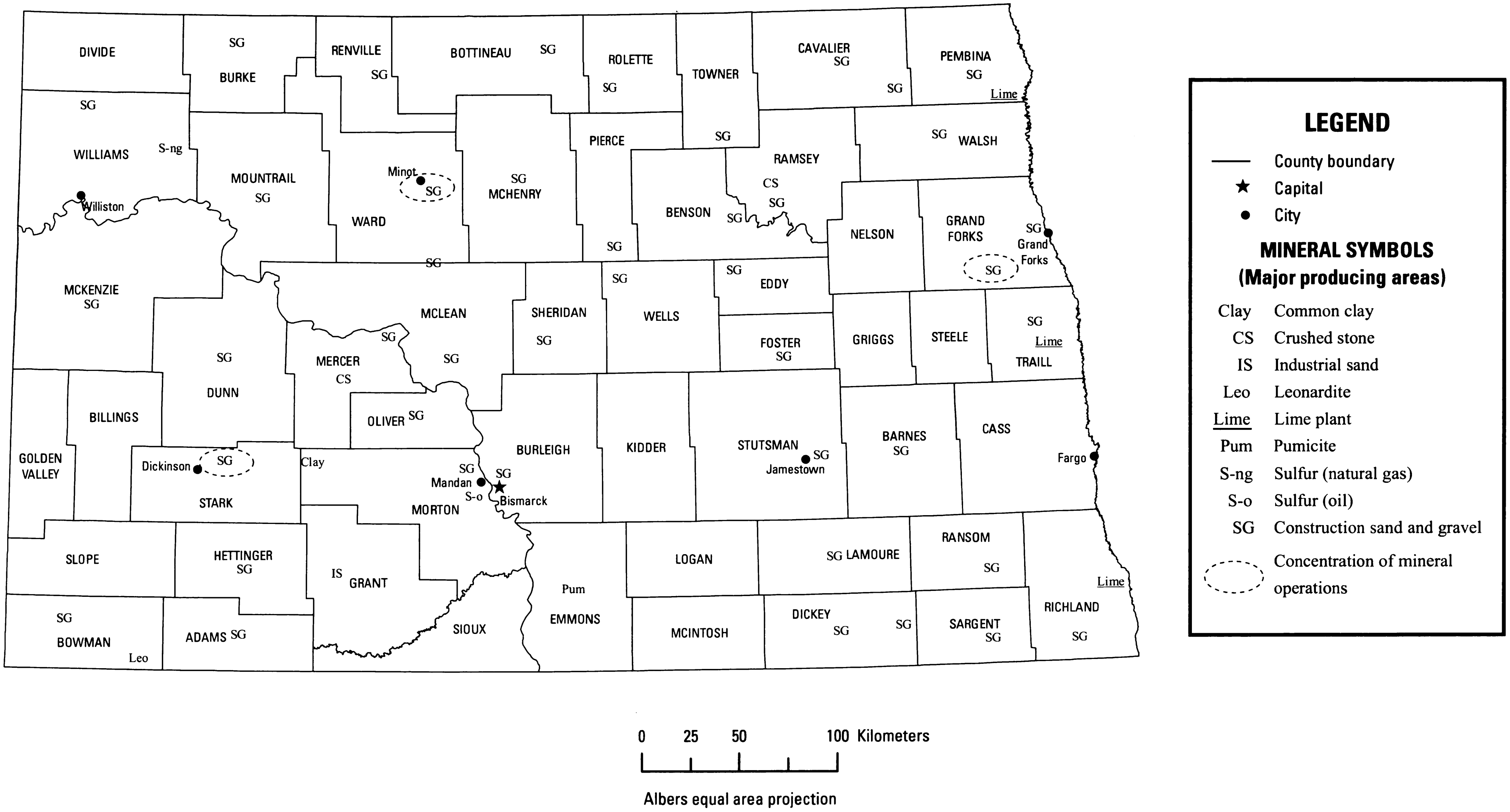
[3] Includes plaster and gunite sands.

[4] Includes road and other stabilization (lime).

[5] Includes filtration and snow and ice control.

[6] Reported and estimated production without a breakdown by end use.

NORTH DAKOTA



Source: North Dakota Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF NORTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2006, North Dakota's nonfuel raw mineral production[1] was valued at $44.4 million, based upon annual U.S. Geological Survey (USGS) data. This represented a somewhat small decrease[2] from the State's total nonfuel mineral value for 2005, which had a similarly small increase in value from 2004 to 2005.

North Dakota's leading nonfuel mineral by value continued to be construction sand and gravel, which the State continued to produce in significant quantities. This high-volume, low unit-value commodity accounted for approximately three-fourths of the State's nonfuel raw mineral production value. Lime was second by value. In 2006, a 2.7-million-metric-ton, or 24%, increase in construction sand and gravel production resulted in a $9.2 million increase in the commodity's value from that of 2005. The State's other nonfuel mineral commodities increased in value except gemstones, which remained unchanged (table 1).

The following narrative information was provided by the North Dakota Geological Survey[3] (NDGS). Production data in the text that follows are those reported by the NDGS based upon that agency's own surveys and estimates.

Commodity Review

Industrial Minerals

During 2006, 17 surface mining operators in the State reported information to the State Soil Conservation Committee (SSCC). The SSCC collects production data by volume, unlike the USGS, which collects data by mass or metric tons produced. Based upon these reports, 88 hectares (ha) was affected. The quantity of minerals mined included 2.01 million cubic meters of sand and gravel, 82,000 cubic meters of clay, 84,000 cubic meters of scoria, and 5,100 cubic meters of crushed stone, totaling more than 2.18 million cubic meters of mineral material. From 64 pits, ranging in size from more than 0.1 ha to 11 ha, a total of 342,000 cubic meters of overburden was disturbed.

Clay and Shale.—All the common clay mined in the State during this period was mined by the Hebron Brick Co. to produce brick. One-third to one-half of the clay mined for the manufacture of brick was kaolinite.

Leonardite.—Leonardite is an oxidized lignite. Currently, American Colloid Co. of Scranton in the southwestern corner of the State and Georesources, Inc. of Williston in northwestern North Dakota are the only leonardite mining operations in North Dakota, although companies mining lignite in the State routinely encounter leonardite. The two companies produced a combined total of approximately 134,000 metric tons (t) of leonardite in 2006, a nearly 72% increase from the 78,000 t produced in 2005. Leonardite is processed and used as a dispersant and viscosity control in oil well drilling muds, as a stabilizer for ion-exchange resins in water treatment, and as a soil conditioner.

Pumice and Pumicite.—Since 1970, volcanic ash (pumicite) has been mined intermittently from the Linton area in the central-southern portion of the State. In 2006, less than 100 t was mined by NURTURE, Inc., a Minneapolis, MN-based company, which produces and distributes an increasing line of volcanic ash-base products. The NDGS has previously determined that this deposit contains approximately one billion tons of pumicite.

Legislation and Government Programs

The SSCC, as designated by the State legislature, continues to administer the Surface Mining Report Law, which requires any person conducting surface mining operations for minerals other than coal to comply with the reporting requirements of North Dakota Century Code Chapter 38–16. Minerals included under the law are cement rock, clay, gravel, limestone, manganese, molybdenum, peat, potash, pumicite, salt, sand, scoria, sodium sulfate, stone, zeolite, or other minerals except coal. The SSCC has the regulatory authority to administer the reporting requirement, while the actual regulatory authority for most of these mining activities rests with the North Dakota Department of Mineral Resources. The law requires that any person or company that within 1 calendar year removes 7,650 cubic meters (10,000 cubic yards) or more of earthen materials or products (including overburden) affecting 0.2 ha (one-half acre) or more in combined mining operations must report the particulars of their surface mining activities. Some operators of smaller operations cooperate by voluntarily submitting summary reports to the SSCC, although not required to by law. Nevertheless, because not all operations report, the summary of surface mining statistics presented above is a conservative estimate of the amount of nonfuel minerals mined in the State in 2006. Information about North Dakota's nonfuel mineral resources, as well as fuel minerals and uranium, is available on the minerals page of the NDGS Web site at URL https://www.dmr.nd.gov/ndgs/Mineral/mineralnew.asp.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] North Dakota's total nonfuel mineral value in actuality significantly increased from that of 2005, but data for common clays, industrial sand and gravel, and lime were withheld so as to not reveal company proprietary data.

[3] Edward C. Murphy, State Geologist, authored the text of State mineral industry information provided by the North Dakota Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	186	76	W	105	W
Gemstones, natural	NA	4	NA	4	NA	4
Sand and gravel, construction	11,700	32,800	11,300	34,500	14,000	43,700
Stone, crushed	W	W	89	396	147	683
Combined values of lime, sand and gravel (industrial), stone [crushed miscellaneous (2004)], and values indicated by the symbol W	XX	11,300	XX	(3)	XX	(3)
Total	XX	44,300	XX	34,900	XX	44,400

NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2
NORTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Granite	1	23	$103	--	--	--
Traprock	1	10	43	--	--	--
Volcanic cinder and scoria	1	42	186	1	139	$644
Miscellaneous stone	1	14	64	1	8	39
Total	XX	89	396	XX	147	683

XX Not applicable. -- Zero.

TABLE 3
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	149	$1,080	$7.27
Asphaltic concrete aggregates and other bituminous mixtures	190	983	5.17
Road base and coverings[2]	3,640	10,900	3.00
Fill	239	497	2.08
Other miscellaneous uses[3]	34	205	6.03
Unspecified:[4]			
Reported	4,520	13,700	3.03
Estimated	5,260	16,400	3.11
Total or average	14,000	43,700	3.12

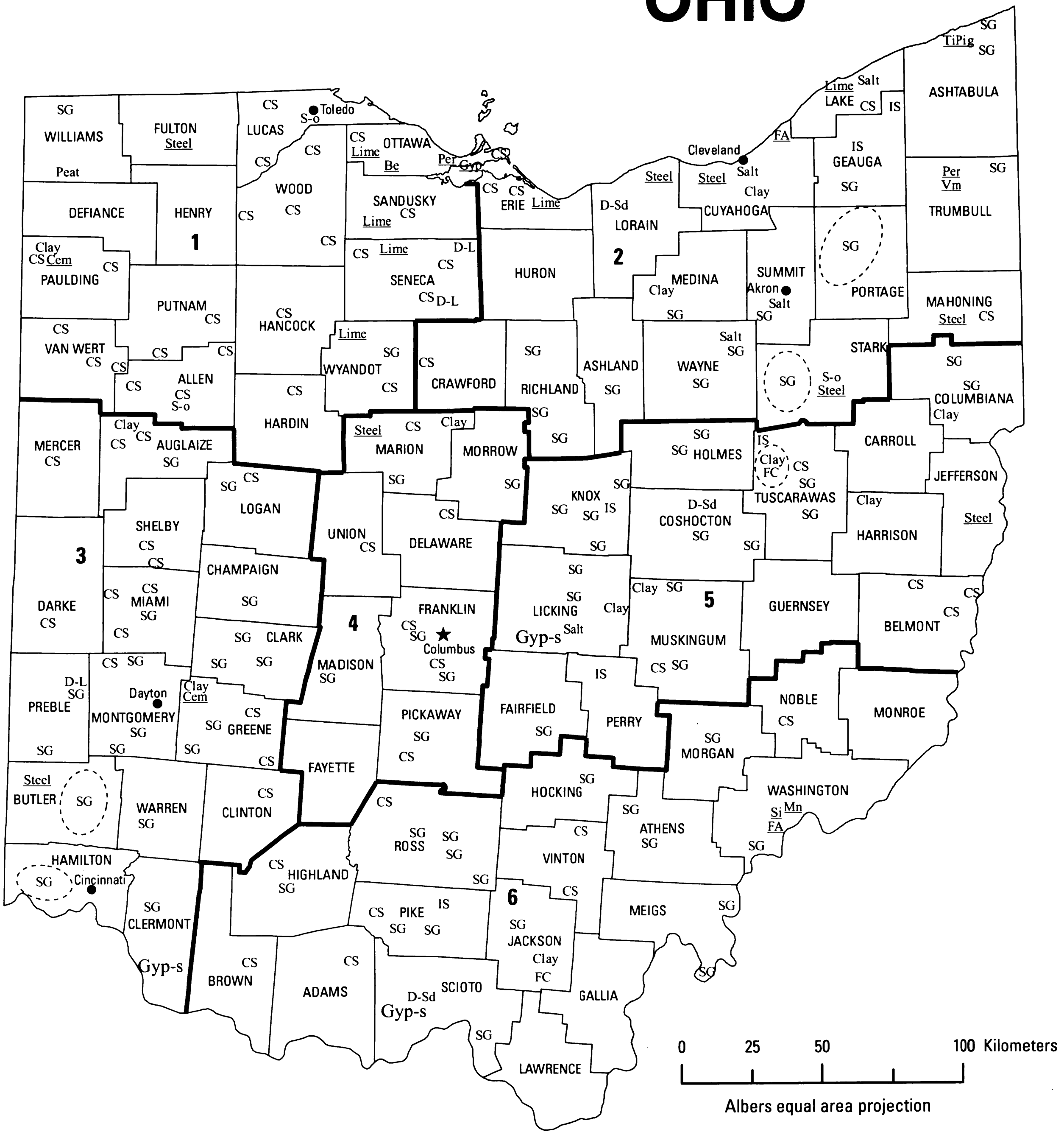
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (cement).

[3] Includes railroad ballast and snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

OHIO



LEGEND

— County boundary
★ Capital
● City
1— Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Be	Beryllium plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mn	Manganese dioxide plant
Peat	Peat
Per	Perlite
Salt	Salt
S-o	Sulfur (oil)
SG	Construction sand and gravel
Si	Silicon metal plant
Steel	Steel plant
TiPig	Titanium dioxide pigment plant
Vm	Vermiculite plant
◌	Concentration of mineral operations

Source: Ohio Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF OHIO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Ohio Department of Natural Resources, Division of Geological Survey, for collecting information on all nonfuel minerals.

In 2006, Ohio's nonfuel raw mineral production was valued[1] at $1.27 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $60 million, or nearly 5%, increase from the State's total nonfuel mineral value for 2005, which was up $80 million, or up more than 7%, from that of 2004. The State was 19th in rank (virtually tied for 16th in 2005 and 13th in 2004) among the 50 States in total nonfuel raw mineral production value and accounted for nearly 2% of the U.S. total value.

Crushed stone by value remained Ohio's leading nonfuel mineral, followed by construction sand and gravel, salt, lime, cement (portland and masonry), and industrial sand and gravel (in descending order of value). Crushed stone and construction sand and gravel accounted for 56% of the State's total nonfuel mineral value. A majority of the State's mineral commodities rose in value in 2006, led by increases in salt, lime, common clays, and cement (masonry and portland). Although salt production dropped slightly, its value rose by more than $35 million, and a 3% increase in lime production led to a $20 million, or 15% increase in the commodity's value. The value of common clays rose by $11 million and that of portland cement was up by $7 million (masonry cement increase in production and value withheld—company proprietary data). The largest decreases took place in the values of crushed stone and industrial sand and gravel, down by about $12 million and $4 million, respectively (table 1).

In 2006, Ohio continued to rank second in the quantities of fire clay produced and fourth in lime and salt. The State rose to fourth from fifth in the production of common clays, and it decreased to eighth from seventh in construction sand and gravel and to ninth from eighth in crushed stone. Additionally, significant quantities of cement and dimension stone were produced in the State. Ohio's mines only produced industrial minerals and coal; metals produced in the State, including aluminum, beryllium, ferroalloys, raw steel, and silicon, were processed from materials received from foreign and other State domestic sources. In 2006, the State continued to be the Nation's second leading raw steel-manufacturing State with an estimated output of about 14.4 million metric tons (Mt), down about 3.4% from 14.9 Mt that was produced in 2005, as reported by the American Iron and Steel Institute (American Iron and Steel Institute, 2007, p. 74). With a significant decrease in production, Ohio was 11th in the production of primary aluminum.

The Ohio Department of Natural Resources, Division of Geological Survey[2] (ODGS), provided the following narrative information, based upon its own surveys, estimates, and data that it acquired from other State agencies.

Commodity Review

Industrial Minerals

Industrial minerals, other than mineral fuels, were either produced or sold by 292 companies from 453 active operations in 2006. Of the 292 operating companies, 28 produced more than one industrial mineral at 30 facilities (Ohio Division of Geological Survey, 2007a, p. 8).

Common Clays.—Clay and shale production was 2.0 Mt in 2006. Belden Brick Co. was the leading producer of building brick in the State, operating seven plants in Tuscarawas County. Total production capacity of the Belden operations was 225 million bricks per year. Several other operators produced millions of additional bricks and other ceramic products at plants located in Columbiana, Harrison, Licking, and Marion Counties. Large quantities of Ohio clay and shale continued to be used in cement manufacture and lightweight-aggregate applications.

Salt.—Salt was produced by three companies at five operations in five counties during 2006. Reported known production of salt for the year was about 4.31 Mt. Cargill Inc., Cargill Salt Division, and Morton International, Inc., Morton Salt Division were the major salt producers in the State, operating rock salt mines (located mostly beneath Lake Erie) in Cuyahoga County and Lake County, respectively. Rock salt sales for the year were reported to be 3.24 Mt. Three brining operations, one each in Licking, Summit, and Wayne Counties, also sold 6,100 t of salt in brine, and an additional 698,000 t of salt that was recovered by evaporation (Ohio Division of Geological Survey, 2007a, p. 21).

Sand and Gravel, Construction.—In 2006, sand and gravel was sold or produced in 60 counties by 192 companies at 278 operations. The majority of the active sand and gravel operations was small to medium in size and served local markets. The largest single operation was Olen Corporation's Columbus Plant, which produced 2.0 Mt of aggregate from glacial outwash and kame terraces in southern Franklin County. Only one other operation, located in Butler County, produced greater than 1 Mt of sand and gravel in 2006. Twenty-five additional pits within the State each produced more than 500,000 metric tons (t) of sand and gravel during the year. Martin Marietta Aggregates continued to lead the State in overall production of sand and gravel, recovering a total of 5.6 Mt from several facilities throughout the State. Most of the State's sand and gravel was used in asphaltic concrete, building materials, portland cement concrete, and road construction/resurfacing materials (Ohio Division of Geological Survey, 2007a, p. 14).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Mark E. Wolfe, a Senior Geologist with the Ohio Division of Geological Survey, authored the text of the State mineral industry information provided by that State agency.

Sand and Gravel, Industrial.—Ohio has an abundance of high-silica sandstones that can be used for glass manufacture and other industrial applications. Best Sand Corp. produced 675,000 t of industrial sand from the Pennsylvanian-Period Sharon Conglomerate in Geauga County during 2006. Ogleby Norton Industrial Sands, Inc. produced about 363,000 t of high-silica sand from operations in Knox and Perry Counties. Production came from the Mississippian-Period Black Hand Sandstone and Pennsylvanian-Period Massillon Sandstone, respectively.

Stone, Crushed.—Reported known production of limestone and dolomite from the State's 106 active quarries, operated in 48 counties, totaled 68.4 Mt in 2006. Shelly Materials Inc. operated the Columbus Limestone Quarry in Franklin County, largest in the State, producing 4.0 Mt of aggregate. Hanson Aggregates Midwest, Inc. led the State in total limestone and dolomite production, recovering 11.6 Mt from 10 quarries. Crushed and broken limestone and dolomite were used principally in road construction and as resurfacing material. Other uses were in production of asphaltic concrete, commercial building materials, and portland cement concrete (Ohio Division of Geological Survey, 2007a, p. 11).

Stone, Dimension.—Based upon ODGS surveys and estimates, production of Ohio dimension sandstone, limestone, and dolomite during 2006 decreased by about 12% compared with that of 2005. Sales of dimension sandstone declined by about 5% compared with that of 2005, as demand moderated somewhat for institutional and residential projects in Ohio and from outside the State (Ohio Division of Geological Survey, 2006, p. 17; 2007a, p. 17). Large stone supply companies in Ohio obtained rough stone from the State's quarries and then cut it to meet customer specifications. National Lime & Stone Company formed a dimension stone subsidiary in 2006, Cascades Cut Stone Company, and planned to market Ohio limestone and dolomite to architectural customers (Markley, 2007).

Government Programs

The ODGS annually prepares and publishes a report on Ohio's coal and industrial mineral industry. Included in the 2006 Report on Ohio Mineral Industries are certain detailed production, employment, and geologic information on each industrial mineral operation in the State. The report is available online at http://www.ohiodnr.com/geosurvey/. A Web-based Geographic Information System version of the Ohio mineral industries map from the report allows a user to directly access a summary of industrial minerals information by permitted operation (Ohio Division of Geological Survey, 2007b).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OHIO[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	98 [r]	13,000 [r, e]	W	W	W	W
Portland	1,020 [r]	85,700 [r, e]	986	89,200 [e]	966	96,100 [e]
Clays:						
Common	1,360	7,480	1,310	6,880	1,580	17,800
Fire	42	W	55	W	W	W
Gemstones, natural	NA	4	NA	4	NA	4
Lime	1,880	127,000	1,790	130,000	1,850	150,000
Sand and gravel:						
Construction	50,800	263,000	51,700	288,000	46,300	289,000
Industrial	1,180	34,200	1,230	37,900	1,110	33,800
Stone:						
Crushed	76,500	396,000	75,200	439,000 [r]	68,500	427,000
Dimension	38	5,100	28	4,880	29	4,950
Combined values of peat (2004–05), salt, and values indicated by the symbol W	XX	197,000	XX	211,000	XX	251,000
Total	XX	1,130,000	XX	1,210,000	XX	1,270,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OHIO: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	97 [r]	65,700 [r]	$392,000	90	61,800	$387,000
Dolomite	9	8,950 [r]	43,500 [r]	8	6,360	37,300
Sandstone	4	476 [r]	3,070 [r]	3	335	2,330
Total	XX	75,200	439,000 [r]	XX	68,500	427,000

[r]Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	414	3,190
Filter stone	132	710
Other coarse aggregate	580	4,460
Total	1,130	8,360
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,620	8,810
Bituminous aggregate, coarse	791	4,110
Bituminous surface-treatment aggregate	688	4,860
Railroad ballast	55	346
Other graded coarse aggregate	4,950	29,500
Total	8,100	47,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	22	125
Stone sand, bituminous mix or seal	714	3,840
Screening, undesignated	66	343
Other fine aggregate	732	4,070
Total	1,530	8,380
Coarse and fine aggregates:		
Graded road base or subbase	4,120	24,800
Unpaved road surfacing	2,610	17,300
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	626	3,320
Other coarse and fine aggregates	2,350	13,100
Total	9,700	58,500
Other construction materials	343	1,670
Agricultural:		
Limestone	(3)	(3)
Other agricultural uses	(3)	(3)
Chemical and metallurgical:		
Cement manufacture	(3)	(3)
Lime manufacture	(3)	(3)
Flux stone	(3)	(3)
Glass manufacture	(3)	(3)
Special, other fillers or extenders	(3)	(3)
Other miscellaneous uses:		
Abrasives	(4)	(4)
Refractory stone	(4)	(4)
Other specified uses not listed	(4)	(4)
Total	8,010	53,300
Unspecified:[5]		
Reported	23,500	148,000
Estimated	12,000	74,000
Total	35,200	221,000
Grand total	68,500	427,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4] Withheld to avoid disclosing company proprietary data; included in "Total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4
OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2[2]		Districts 3 and 4[2]		Districts 5 and 6[2]	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	550	4,040	190	1,380	386	2,940
Coarse aggregate, graded[4]	6,230	36,200	811	4,710	1,060	6,630
Fine aggregate (-⅜ inch)[5]	868	4,750	123	756	543	2,880
Coarse and fine aggregate[6]	4,850	28,600	543	2,880	2,330	14,400
Other construction materials	343	1,670	--	--	--	--
Agricultural[7]	W	W	W	W	137	1,020
Chemical and metallurgical[8]	2,580	14,500	W	W	W	W
Special[9]	W	W	--	--	W	W
Other miscellaneous uses[10]	3,940	24,000	4,060	29,200	8	50
Unspecified:[11]						
Reported	7,420	46,600	11,800	74,300	4,290	26,600
Estimated	8,800	54,000	2,100	13,000	860	6,800
Total	36,300	219,000	22,500	145,000	9,710	61,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2, 3 and 4, 5 and 6 are combined to avoid disclosing company proprietary data.

[3] Includes macadam, filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes agricultural limestone and other agricultural uses.

[8] Includes cement, lime, and glass manufacture and flux stone.

[9] Includes other fillers and extenders.

[10] Includes abrasives, refractory stone, and other specified uses not listed.

[11] Reported and estimated production without a breakdown by end use.

TABLE 5
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,670	$36,600	$5.49
Plaster and gunite sands	40	659	16.48
Concrete products (blocks, bricks, pipe, decorative, etc.)	106	662	6.25
Asphaltic concrete aggregates and other bituminous mixtures	2,850	16,900	5.91
Road base and coverings	2,280	14,700	6.44
Road stabilization (cement)	115	908	7.90
Road stabilization (lime)	12	24	2.00
Fill	4,600	25,400	5.52
Snow and ice control	91	371	4.08
Other miscellaneous uses[2]	474	3,950	8.33
Unspecified:[3]			
Reported	17,800	121,000	6.82
Estimated	11,300	67,800	6.01
Total or average	46,300	289,000	6.24

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes filtration and roofing granules.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	1,820	9,650	2,810	16,000
Asphaltic concrete aggregates and other bituminous mixtures	W	W	939	6,970	804	4,060
Road base and coverings[3]	145	768	685	4,240	848	6,100
Fill	159	631	1,220	7,820	2,660	13,400
Snow and ice control	--	--	12	55	W	W
Other miscellaneous uses[4]	517	3,340	82	828	120	1,360
Unspecified:[5]						
Reported	--	--	3,080	21,300	7,100	50,100
Estimated	502	3,010	4,810	28,900	1,680	10,100
Total	1,320	7,750	12,600	79,700	16,000	101,000

Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	506	2,420	1,180	6,560
Asphaltic concrete aggregates and other bituminous mixtures	W	W	585	2,790	W	W
Road base and coverings[3]	228	1,450	457	2,810	49	274
Fill	190	1,400	286	1,790	83	341
Snow and ice control	W	W	35	122	W	W
Other miscellaneous uses[4]	584	3,710	54	238	181	990
Unspecified:[5]						
Reported	571	3,800	3,710	24,300	3,310	21,700
Estimated	1,830	11,000	1,770	10,700	689	4,130
Total	3,410	21,400	7,410	45,100	5,490	34,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

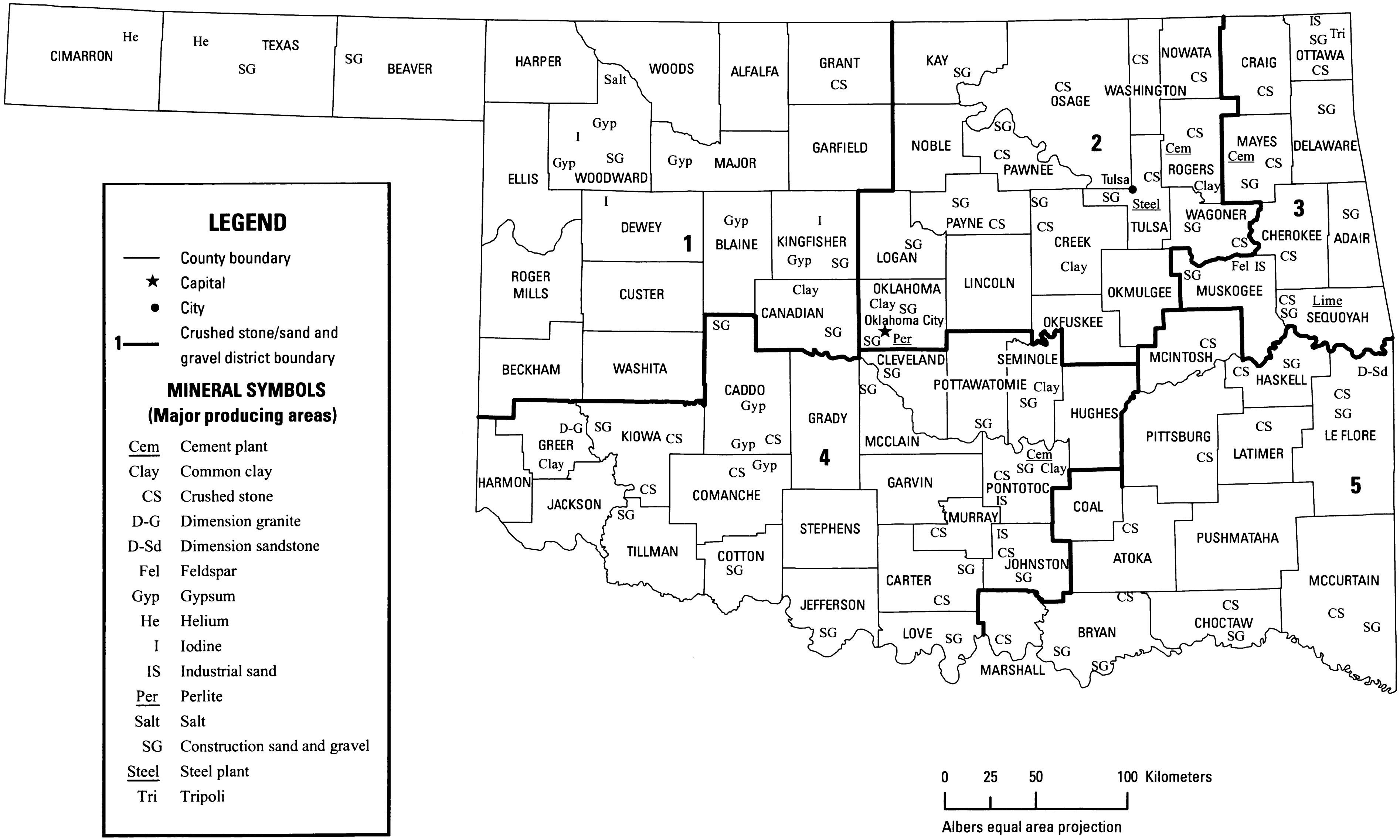
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes filtration and roofing granules.

[5] Reported and estimated production without a breakdown by end use.

OKLAHOMA



Source: Oklahoma Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF OKLAHOMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Oklahoma Geological Survey for collecting information on all nonfuel minerals.

In 2006, Oklahoma's nonfuel raw mineral production[1] was valued at $684 million, based upon annual U.S. Geological Survey (USGS) data. This was a $66 million, or 10.7%, increase from the State's total nonfuel mineral value for 2005, which then had increased by $99 million, or 19%, from 2004 to 2005. The State was 32d in rank among the 50 States in total nonfuel mineral production value, accounting for more than 1% of the U.S. total value.

In 2006, crushed stone continued to be Oklahoma's leading nonfuel mineral commodity, based upon value, accounting for more than 37% of the State's total nonfuel mineral production value. Crushed stone was followed by cement (portland and masonry), construction sand and gravel, industrial sand and gravel, iodine, and gypsum (descending order of value). The combined values of three of Oklahoma's four major construction materials—crushed stone, construction sand and gravel, and gypsum (descending order of value)—accounted for about 55% of the State's total value. (Data for portland cement were withheld—company proprietary data.)

Most of Oklahoma's increase in value in 2006 resulted from increases in the values, in descending order of change, of construction sand and gravel, crude iodine, cement (masonry and portland), crude gypsum, and industrial sand and gravel, which rose, respectively, by nearly $27 million, by more than $20 million, by more than $10 million, by $9 million, and by nearly $7 million. The unit values of each of these nonfuel mineral commodities also increased, the increase in that of crude iodine being by far the largest, followed by that of cement, construction sand and gravel, industrial sand and gravel, and crude gypsum (in descending order of increase). Relatively few mineral commodities had decreases in value, the largest of which was in that of crushed stone, down by $14 million. Although small in comparison to most of the State's other mineral commodities, the value of gemstones continued its rebound in 2006. The commodity's value rose to $106,000 in 2006 from $43,000 in 2005 after dropping to an uncharacteristic low of $4,000 in 2004 (table 1). In recent years, the total value of gemstones production typically has ranged from $200,000 to more than $300,000, annually; a high of more than $600,000 was reached in 1996.

Oklahoma's mines exclusively produced industrial minerals; no metals were mined in the State. In 2006, Oklahoma continued to be the only State that produced iodine and it continued to be first in the quantities of crude gypsum produced. The State also remained second of 4 States that produce tripoli and fourth in the production of feldspar. Oklahoma rose to 5th from 7th in industrial sand and gravel production, to 6th from 11th in common clays, and to 10th from 12th in the production of masonry cement. Additionally, the State continued to be a significant producer of crushed stone, portland cement, and construction sand and gravel (descending order of value).

The narrative information that follows was provided by the Oklahoma Geological Survey[2] (OGS). Production data in the text that follow are those reported by the OGS based upon that agency's own surveys and estimates. Data may differ from some production figures or other data as reported to the USGS.

Mining Employment

The Oklahoma Department of Mines (ODOM) recorded nonfuel minerals production from 422 mines in the State during 2006, from a total of 549 permitted mining sites on file. Most of the producing mines were open pit mines. Exceptions were brine wells from which iodine and salt were produced, natural gas wells from which helium was produced, and one underground mine from which limestone was produced. Operators of 366 mines within the nonfuel mining industry directly employed 31,684 persons in 2006, excluding those employed by iodine and helium operators.

Commodity Review

Industrial Minerals

Clays.—Boral Bricks Inc. held grand opening ceremonies in March at its newly constructed brick plant in Union City (Boral Bricks Inc., 2006). Construction of the new plant was completed in late 2005, with initial production of brick beginning in January 2006. The production capacity of 100 million bricks per year at this 15,300-square-meter facility effectively increased Boral's brick manufacturing capacity by 6% in the United States. As part of an overall sustainability plan for the operation of the plant, methane gas generated from a landfill located near the plant was used as a fuel for the brick kilns, supplementing the natural gas supplied through the local utility company. The Boral plant, which employs about 50 people, supplies bricks to customers in Arkansas, Oklahoma, and Texas.

During the year, Boral conducted various product development activities with emphasis on the production of desired brick colors and textures. Conclusions from product development tests indicated that the Permian Dog Creek Shale, the clay deposit mined for making the brick, did not require the addition of grog in the brick manufacturing process. Elimination of the use of grog was advantageous in that an appropriate source of grog was not available near the brick production plant. Grog, a nonplastic, crushed-fired brick waste, is used to enhance certain brick properties or facilitate a processing step, such as drying the clay, particularly when using more highly plastic clays. The Dog Creek material is a reddish-brown to orange-brown shale with thin interbedded siltstones and fine-grained sandstones.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be accessed over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Stanley T. Krukowski, Industrial Minerals Geologist IV with the Oklahoma Geological Survey, authored the text of the State mineral industry information provided by that agency.

Sand and Gravel.—Dolese Bros. Co. completed construction of its sand production plant on the Canadian River 8 kilometers south of Mustang. The Canadian River, along with its tributaries, makes up approximately 30% of the Arkansas River drainage basin. Erosion of various rocks along the river in New Mexico, the north Texas panhandle, and western Oklahoma contribute to the alluvial deposits dredged at the plant site. Various types of sand and gravel including, but not restricted to, concrete sand, fill sand, pea gravel, and larger gravel were produced at the plant. It was anticipated that total plant production would reach a rate of approximately 540 metric tons per hour.

Stone, Crushed.—Meridian Aggregates (a wholly owned subsidiary of Martin Marietta Materials, Inc.) began aggregates production at its 280-hectare (ha), North Troy quarry near Mill Creek in Johnston County. An agreement with the Oklahoma Water Resources Board (OWRB) allowed the company to drill a new water well that would draw 173 hectare-meters per year of water. The water was to be used to wash aggregate material that was extracted from the quarry. Development of the quarry operation had been postponed as a result of environmental concerns presented by local residents on the effects the water usage from the well would have on nearby springs and streams. In order to appropriately monitor the effects of the water usage, Meridian established a water monitoring and management plan with the U.S. National Park Service and the U.S. Fish and Wildlife Service.

Upon completion of the drilling of the well to a depth of 325 meters in August, Meridian began its monitoring and management plan for the well and surrounding springs. Part of the plan called for Meridian to monitor ground water and surface water in the quarry's vicinity. The plan also included monitoring the water levels in six wells, and the volume of flow in two nearby streams. Meridian, under an agreement with the USGS and the OWRB, installed continuous water-level recorders in three wells maintained by the OWRB. Water-level recorders also were installed in two wells maintained by the USGS and one maintained by Meridian, the latter located near the quarry. Funded by Meridian, the USGS installed two new water-flow gages at points on each of the two streams where the OWRB previously had monitoring stations. The OWRB hoped that the new data collected would supply additional information for a better understanding of the nature of the aquifer.

Legislation and Government Programs

The U.S. Environmental Protection Agency (EPA) proposed new criteria for the use of chat in highway and other transportation construction projects, and in nontransportation/nonresidential concrete and construction projects. Chat refers to the dolomite, limestone, and siliceous rock fragments rejected in lead-zinc milling operations in the Tri-State Mining District of northeastern Oklahoma (Tar Creek) in Ottawa County. Additional information on the Tar Creek Superfund Site and the use of chat can be accessed at http://cfpub1.epa.gov/supercpad/cursites/csitinfo.cfm?id=0601269. Lead and zinc were produced in the Tri State Mining District beginning in the 19th century until the mid-20th century. The chat is stockpiled at the former mill sites and has been utilized for decades as aggregate material in railroad ballast, highway construction, and concrete production. According to the EPA, the beneficial use of chat "will reduce the current health and environmental hazards posed by existing surface-level chat piles." About 91 million metric tons of chat is contained in mine waste stockpiles in the Tri-State District, which covers approximately 6,500 square kilometers in Kansas, Missouri, and Oklahoma (Environmental Protection News, 2006).

The Wildlife Habitat Council, at its 2005 Annual Symposium, recognized the Lafarge North America cement plant in Tulsa, along with 143 other sites, for its contributions to wildlife habitat conservation and biodiversity. The plant had set aside about 10% of its 530-ha property for wildlife habitat enhancement projects, which included several ponds, wetlands, and grasslands. Habitat enhancement projects were conducted on about 8 ha of the property. The project area shares a common border with the Redbud Valley Nature Preserve, allowing the two organizations to benefit from each other's mutual goals.

References Cited

Boral Bricks Inc., 2006, It's official: Boral Bricks Inc. news release, April 6, 1 p. (Accessed September 19, 2008, at http://www.boralbricks.com/News/NewsDetail.aspx?nid=48.)

Environmental Protection News, 2006, EPA proposes criteria for using chat from Tar Creek (Okla.), other areas: Environmental Protection News, March 1, 1 p. (Accessed September 23, 2008, at http://www.eponline.com/articles/53959/.)

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN OKLAHOMA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	1,150	2,410	903	2,520	1,180	4,700
Gemstones, natural	NA	4	NA	43	NA	106
Gypsum, crude	3,250	20,800	2,620	18,400	3,860	27,400
Iodine, crude metric tons	1,130	W	1,570	W	W	W
Sand and gravel:						
Construction	12,000	53,700	13,300	65,000	17,000	91,900
Industrial	1,390	31,600	1,480	33,500	1,640	40,400
Stone:						
Crushed	39,800	206,000	47,300 [r]	269,000 [r]	43,300	255,000
Dimension	17	2,100	3	501	3	502
Tripoli metric tons	32,100	2,120	30,600	1,950	18,400	1,890
Combined values of cement, feldspar, helium (Grade–A), lime, salt, and values indicated by the symbol W	XX	199,000	XX	227,000	XX	263,000
Total	XX	519,000	XX	618,000 [r]	XX	684,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

OKLAHOMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	48 [r]	41,200 [r]	$231,000 [r]	45	38,000	$224,000
Granite	4	3,740	23,900	4	2,840	16,600
Sandstone and quartzite	6 [r]	1,190 [r]	6,760 [r]	5	850	5,050
Miscellaneous stone	9 [r]	1,150 [r]	6,460 [r]	8	1,590	8,840
Total	XX	47,300 [r]	269,000 [r]	XX	43,300	255,000

[r] Revised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	116	1,120
Filter stone	52	377
Other coarse aggregate	5	30
Total	173	1,530
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,980	13,800
Bituminous aggregate, coarse	462	2,690
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	4,060	21,000
Total	6,990	41,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	1,000	4,880
Other fine aggregate	10	33
Total	1,350	6,270
Coarse and fine aggregates:		
Graded road base or subbase	2,440	14,100
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	1,500	9,280
Total	4,000	23,800
Agricultural, limestone	(2)	(2)
Chemical and metallurgical, cement manufacture	(2)	(2)
Other miscellaneous uses and specified uses not listed	(2)	(2)
Unspecified:[3]		
Reported	22,000	130,000
Estimated	6,600	39,000
Total	28,600	169,000
Grand total	43,300	255,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2[2]		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	2,600	18,600	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W	--	--
Coarse and fine aggregate[6]	3,090	18,400	268	1,650	--	--
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	W	W	W	W
Other miscellaneous uses and specified uses not listed	--	--	W	W	--	--
Unspecified:[9]						
Reported	2,000	11,900	772	4,580	14,100	83,100
Estimated	--	--	2,400	14,000	670	4,000
Total	9,000	55,400	4,820	31,700	19,700	110,000

	District 5	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregate[6]	639	3,810
Agricultural[7]	W	W
Chemical and metallurgical[8]	--	--
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[9]		
Reported	5,180	30,400
Estimated	3,500	21,000
Total	9,760	57,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[6] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and unpaved road surfacing.

[7] Includes agricultural limestone.

[8] Includes cement manufacture.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	3,070	$18,000	$5.86
Plaster and gunite sands	102	669	6.57
Asphaltic concrete aggregates and other bituminous mixtures	764	4,500	5.89
Road base and coverings	743	2,650	3.57
Fill[2]	1,970	8,700	4.41
Other miscellaneous uses[3]	15	426	28.40
Unspecified:[4]			
Reported	4,490	25,500	5.69
Estimated	5,830	31,400	5.39
Total or average	17,000	91,900	5.41

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes filtration.

[3] Includes snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	159	937	1,600	8,920	W	W	863	5,770	W	W
Asphaltic concrete aggregates and road base materials	294	815	W	W	W	W	578	2,490	--	--
Fill	169	269	734	4,520	W	W	785	1,910	W	W
Other miscellaneous uses[3]	--	--	360	2,700	2,010	11,700	--	--	704	3,750
Unspecified:[4]										
Reported	797	4,920	762	4,380	W	W	1,340	7,390	W	W
Estimated	261	1,410	1,910	10,300	421	2,210	2,420	13,000	820	4,430
Total	1,680	8,350	5,370	30,800	2,430	13,900	5,980	30,600	1,520	8,180

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

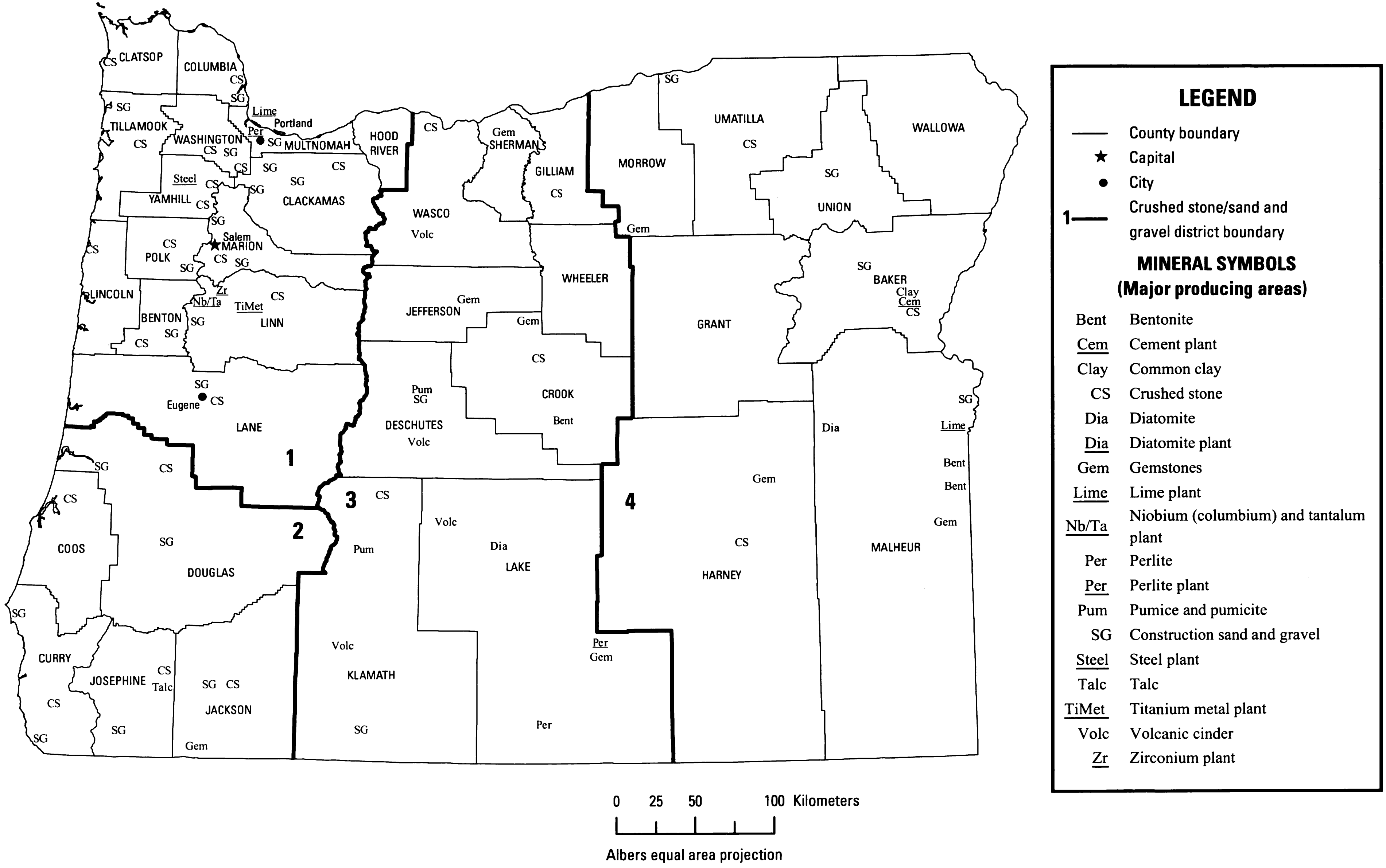
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration and snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

OREGON



Source: Oregon Department of Geology and Mineral Industries/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF OREGON

In 2006, Oregon's nonfuel raw mineral production[1] was valued at $509 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $70 million, or nearly 16%, from the State's total nonfuel mineral value of $439 million in 2005, which followed a $72 million, or 19.6%, increase from 2004 to 2005. The State ranked 36th among the 50 States in total nonfuel mineral production value and accounted for nearly 1% of the U.S. total.

Industrial minerals accounted for all of Oregon's nonfuel raw mineral and material production. Crushed stone, construction sand and gravel, and portland cement, in descending order of value, remained the State's leading nonfuel mineral commodities, followed by diatomite, crude perlite, pumice and pumicite, and gemstones. Construction sand and gravel and crushed stone accounted for nearly 72% of Oregon's total nonfuel mineral production value, while the combined total of these seven mineral commodities accounted for about 99% of the State's total nonfuel raw mineral economy.

In 2006, Oregon's rise in nonfuel mineral value was led by increases in the values of construction sand and gravel, crushed stone, and portland cement. Significant increases took place in the unit values of each of the three. An 8% increase in the production of construction sand and gravel led to a $29 million, or a nearly 20%, increase in the commodity's value, while a nearly 7% decrease in crushed stone production resulted in a $25 million, or 15% increase, in its value. With a relatively small increase in portland cement production, its value rose by more than $15 million. Although being a comparatively smaller increase, the value of gemstones rose a substantial 58% to $1.86 million in 2006 from the State's $1.18 million of 2005 (table 1). The largest decrease in value took place in that of lime, down by about $4 million.

In 2006, Oregon continued to be second in the quantity of crude perlite produced as compared with other producing States, and third in the production of diatomite. The State rose in rank to second from third in the production of gemstones (gemstones based upon value), and it decreased to second from first in that of pumice and pumicite. Additionally, Oregon remained a significant producer of crushed stone and construction sand and gravel; the production and value of common clays was up substantially.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN OREGON[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, bentonite	10	W	W	W	W	W
Gemstones, natural	NA	1,210	NA	1,180	NA	1,860
Sand and gravel, construction	21,000	125,000	22,000	146,000	23,800	175,000
Stone, crushed	22,700	126,000	26,800 [r]	164,000 [r]	25,000	189,000
Combine values of cement (portland), clays (common), diatomite, lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by the symbol W	XX	114,000	XX	128,000	XX	143,000
Total	XX	367,000	XX	439,000 [r]	XX	509,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

OREGON: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	1	1,290	$7,120	1	1,240	$6,750
Granite	1	2	14	--	--	--
Traprock	116 r	21,800 r	135,000 r	113	18,200	140,000
Volcanic cinder and scoria	3	47	261	6	28	222
Miscellaneous stone	20 r	3,620 r	21,600 r	29	5,510	42,400
Total	XX	26,800 r	164,000 r	XX	25,000	189,000

r Revised. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	56	584
Filter stone	80	795
Other coarse aggregate	622	4,060
Total	758	5,440
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	282	2,660
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	143	1,100
Other graded coarse aggregate	308	2,230
Total	758	6,350
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	19	47
Other fine aggregate	210	2,110
Total	409	3,730
Coarse and fine aggregates:		
Graded road base or subbase	3,280	26,200
Unpaved road surfacing	943	7,160
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	481	3,440
Roofing granules	(2)	(2)
Other coarse and fine aggregates	2,520	18,700
Total	7,450	56,700
Other construction materials	56	339
Chemical and metallurgical, cement manufacture	(3)	(3)
Special, asphalt fillers or extenders	(3)	(3)
Other miscellaneous uses:		
Lightweight aggregate (slate)	(4)	(4)
Other specified uses not listed	(4)	(4)
Unspecified:[5]		
Reported	7,840	59,900
Estimated	6,600	51,000
Total	14,500	111,000
Grand total	25,000	189,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2[2]		Districts 3 and 4[2]		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	644	4,720	112	708	2	14
Coarse aggregate, graded[4]	457	3,670	301	2,690	--	--
Fine aggregate (-⅜ inch)[5]	150	1,390	259	2,340	--	--
Coarse and fine aggregates[6]	6,290	48,800	1,160	7,860	--	--
Other construction materials	--	--	56	339	--	--
Chemical and metallurgical[7]	--	--	W	W	--	--
Special[8]	--	--	W	W	--	--
Other miscellaneous uses[9]	(10)	(10)	(10)	(10)	--	--
Unspecified:[11]						
Reported	4,650	35,700	345	2,500	2,850	21,700
Estimated	6,000	46,000	630	4,800	--	--
Total	18,200	140,000	3,910	27,100	2,850	21,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2 and 3 and 4 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7] Includes cement manufacture.

[8] Includes asphalt fillers or extenders.

[9] Includes lightweight aggregate (slate) and other specified uses not listed.

[10] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[11] Reported and estimated production without a breakdown by end use.

TABLE 5

OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	2,510	$22,800	$9.10
Plaster and gunite sands	11	210	19.09
Asphaltic concrete aggregates and other bituminous mixtures	1,430	11,900	8.37
Road base and coverings	3,510	22,700	6.48
Fill	340	1,730	5.07
Snow and ice control	6	48	8.00
Filtration	15	163	10.87
Other miscellaneous uses	550	3,550	6.46
Unspecified:[2]			
Reported	10,000	72,200	7.21
Estimated	5,370	39,400	7.34
Total or average	23,800	175,000	7.36

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		Districts 2		District 3		District 4		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	839	6,720	707	6,910	737	6,620	235	2,760	--	--
Asphaltic concrete aggregates and other bituminous mixtures	548	4,200	452	4,330	W	W	W	W	--	--
Road base and coverings	2,040	14,100	534	3,730	790	4,170	143	690		
Fill	45	144	W	W	219	1,040	W	W	--	--
Other miscellaneous uses[3]	497	3,330	74	671	423	3,270	80	432	--	--
Unspecified:[4]										
Reported	8,270	58,900	860	7,470	21	104	30	218	839	5,540
Estimated	3,580	26,500	380	2,810	850	6,280	559	3,860	--	--
Total	15,800	114,000	3,010	25,900	3,040	21,500	1,050	7,960	839	5,540

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

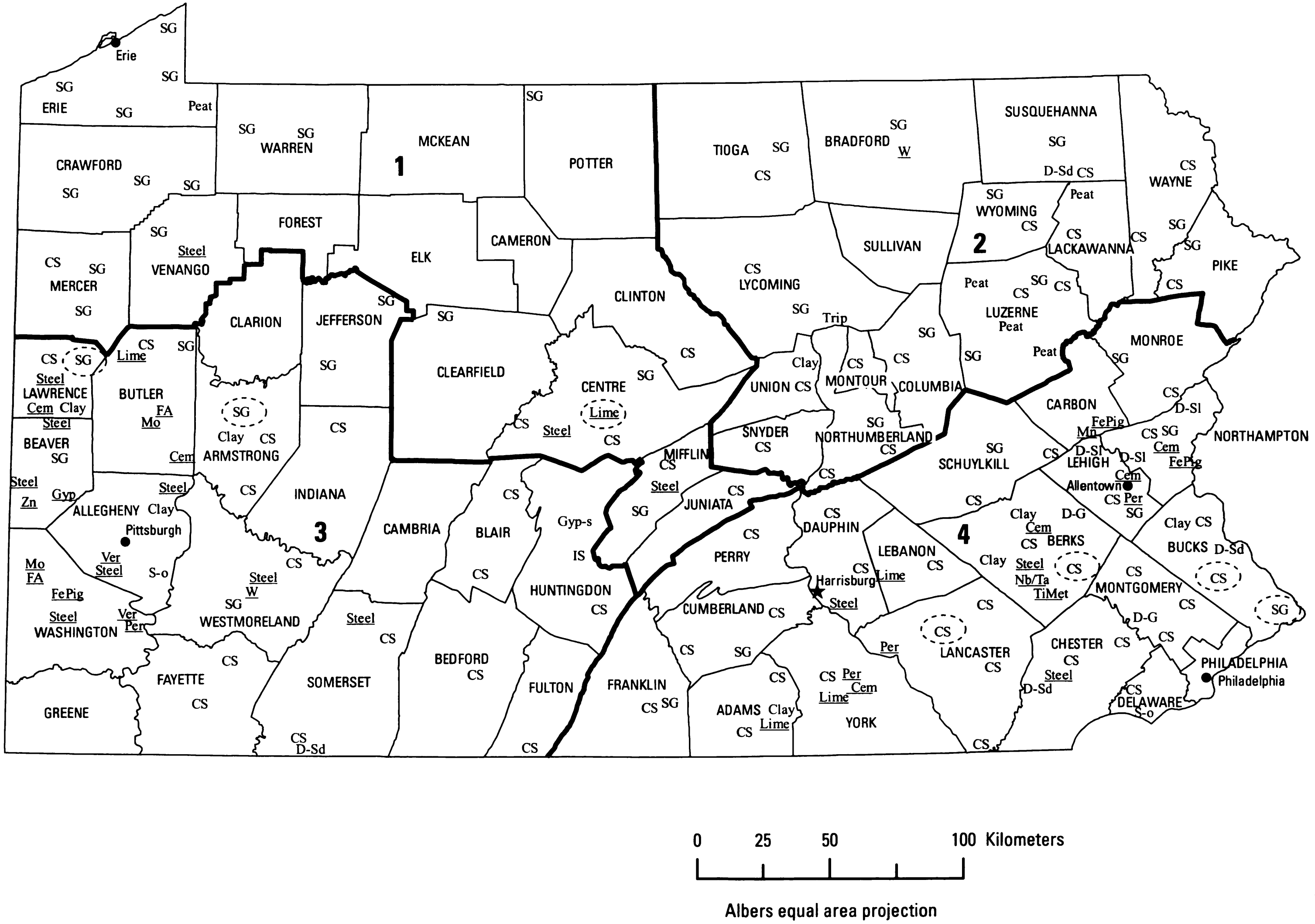
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration and snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

PENNSYLVANIA



Albers equal area projection

LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-Sd	Dimension sandstone
D-Sl	Dimension slate
FePig	Iron oxide pigments plant
FA	Ferroalloys plant
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mo	Molybdenum plant
Nb/Ta	Niobium and tantalum plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
TiMet	Titanium metal plant
Trip	Tripoli
W	Tungsten plant
Ver	Vermiculite plant
Zn	Zinc plant
◌	Concentration of mineral operations

Source: Pennsylvania Bureau of Topographic and Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF PENNSYLVANIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Pennsylvania Bureau of Topographic and Geologic Survey for collecting information on all nonfuel minerals.

In 2006, Pennsylvania's nonfuel raw mineral production[1] was valued at $1.71 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $150 million, or 9.6%, increase from the $1.56 billion total value for 2005, which also had increased by $150 million, or up by 10.6%, from 2004 to 2005. Pennsylvania continued to rank 12th in the Nation in total nonfuel mineral production value and accounted for more than 2.5% of the U.S. total value. [The actual totals for 2005–06 are higher than those shown in table 1; tripoli data have been withheld (company proprietary data).]

In 2006, Pennsylvania continued to be among the Nation's leading States in the production of crushed stone and cement (portland and masonry) (descending order of value). These two mineral commodities and construction sand and gravel, the next highest by value, accounted for about 91.5% of Pennsylvania's total nonfuel raw mineral production value. Lime accounted for about 6.7% of the same total value (table 1), followed by industrial sand and gravel and dimension stone, with slightly less than 1% each.

Nearly all of the State's nonfuel mineral commodities increased in value in 2006, led especially by the increases in crushed stone and portland cement. Although production did increase for a majority of the mineral commodities, much of the increase in 2005 and 2006 resulted from higher average unit prices for most of the commodities.

The production value of crushed stone increased by $75 million, or nearly 11%, partly resulting from a nearly 4% increase in production. Although portland cement production decreased by 4%, its value increased by $45 million, or up by 8%. Construction sand and gravel followed with a 14% value increase of $15 million and lime was up by almost $12 million. Other mineral commodities with increases in value of $1 million or more included masonry cement, common clays, and dimension stone, up by $2.5 million, slightly more than $2 million, and $1 million, respectively. The average unit values of all of these nonfuel mineral commodities increased in 2006, although that of dimension stone rose only slightly. The only decreases in total commodity value (small relative to those with increases) took place in peat and tripoli (table 1).

In 2006, Pennsylvania continued to rank third in the Nation in the quantity of crushed stone and in the quantity of portland cement produced. The State also remained fourth of four States that produced tripoli, sixth in masonry cement, and seventh in the production of lime. Additionally, substantial quantities of construction sand and gravel, industrial sand and gravel, dimension stone, and common clays were produced in the State. With regard to raw minerals and mineral materials, Pennsylvania is exclusively an industrial mineral- and coal-producing State, producing no primary metals from ores mined within the State; metals that were produced in the State, principally steel, as well as, niobium, tantalum, titanium, and zinc, were processed from materials acquired from foreign and other domestic sources. Pennsylvania rose in rank to third from fourth in the Nation in the production of raw steel in 2006, with an output of 6.18 million metric tons (Mt), up from the 5.9 Mt produced in 2005 (American Iron and Steel Institute, 2007, p. 74).

The Pennsylvania Bureau of Topographic and Geologic Survey, the Pennsylvania Geological Survey[2] (PGS), provided the following narrative information.

Government Programs and Activities

The PGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: 1) FEDMAP, which funds Federal geologic mapping projects, 2) STATEMAP, which is a matching-funds grant program with State geological surveys, and 3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Maps were produced at a scale of 1:24,000.

In 2006, PGS map projects included digital maps of bedrock geology, which were produced covering the following areas of Pennsylvania: the Chester Valley and Piedmont portion of the Germantown, Malvern, Norristown, and Valley Forge quadrangles, Chester, Delaware, Montgomery, and Philadelphia Counties; the Honey Brook quadrangle, Chester and Lancaster Counties; the Oxford and Pennsylvania portion of the Bay View quadrangles, Chester and Lancaster Counties; and the Parkesburg quadrangle, Chester and Lancaster Counties.

Digital maps of surficial geology were produced covering the following areas: the Barbours 7.5-minute quadrangle, Lycoming and Sullivan Counties; the Bodines 7.5-minute quadrangle, Lycoming County; the Center Moreland 7.5-minute quadrangle, Wyoming and Luzerne Counties; the Factoryville 7.5-minute quadrangle, Wyoming and Lackawanna Counties: the Great Bend 7.5-minute quadrangle, Susquehanna County; the Hawley 7.5-minute quadrangle, Wayne County; the Hop Bottom 7.5-minute quadrangle, Susquehanna and Wyoming Counties; the Kingston 7.5-minute quadrangle, Luzerne County;

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] John H. Barnes, P. G., Supervisory Geologist with the Pennsylvania Geological Survey, authored the text of the State mineral industry information provided by that State agency.

the Lake Ariel 7.5-minute quadrangle, Wayne and Lackawanna Counties; the Lakeville 7.5-minute quadrangle, Wayne County; the Olyphant 7.5-minute quadrangle, Lackawanna County; the Pittston 7.5-minute quadrangle, Luzerne and Lackawanna Counties; the Ransom 7.5-minute quadrangle, Lackawanna, Wyoming, and Luzerne Counties; the Scranton 7.5-minute quadrangle, Lackawanna County; the Springville 7.5-minute quadrangle, Susquehanna and Wyoming Counties, the Starrucca 7.5-minute quadrangle, Wayne and Susquehanna Counties; the Susquehanna 7.5-minute quadrangle, Susquehanna County; and the Tunkhannock 7.5-minute quadrangle, Wyoming County.

More information on the geology, hydrology, mineral resources, and mining history of Pennsylvania, as well as a variety of PGS publications is available from the Pennsylvania Geological Survey. Much of this information, PGS contact information, and several educational series publications regarding both nonfuel and fuel minerals are available over the Internet at http://www.dcnr.state.pa.us/topogeo/.

Reference Cited

American Iron and Steel Institute, 2007, Table 24—Raw steel production by States, *in* American Iron and Steel Institute, AISI 2006 ASR: Washington, DC, American Iron and Steel Institute, 126 p.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN PENNSYLVANIA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Cement:						
Masonry	W	W	399	49,700 [e]	384	52,200 [e]
Portland	6,230	473,000 [e]	6,290	554,000 [e]	6,020	599,000 [e]
Clays, common	822	3,270	705	3,460	742	5,630
Gemstones, natural	NA	1	NA	1	NA	1
Lime	1,220	100,000	1,100	104,000	1,160	115,000
Peat	11	307	7	210	1	52
Sand and gravel:						
Construction	20,000	127,000	17,000	111,000	18,400	126,000
Industrial	W	W	711	15,400	696	15,500
Stone:						
Crushed	113,000	639,000	107,000 [r]	713,000 [r]	111,000	788,000
Dimension	33	10,100	35	11,800	38	12,800
Combined values of tripoli and values indicated by the symbol W	XX	55,800	XX	(3)	XX	(3)
Total	XX	1,410,000	XX	1,560,000 [r]	XX	1,710,000

[e] Estimated. [r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value withheld to avoid disclosing company proprietary data.

TABLE 2

PENNSYLVANIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone[2]	109 r	61,300 r	$413,000 r	104	64,600	$460,000
Dolomite	13	12,400	79,700	11	11,800	82,200
Marble	1	W	W	1	W	W
Granite	7	6,450	40,700	6	4,280	30,600
Traprock	7 r	4,700 r	33,000 r	7	6,480	46,800
Sandstone and quartzite	41 r	10,800 r	73,500 r	42	12,700	91,600
Slate	11 r	W	W	11	W	W
Miscellaneous stone	18 r	9,530 r	62,400 r	17	9,320	65,300
Total	XX	107,000 r	713,000 r	XX	111,000	788,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	580	4,790
Riprap and jetty stone	512	4,390
Filter stone	417	3,180
Other coarse aggregate	3,370	27,300
Total	4,880	39,700
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,520	18,800
Bituminous aggregate, coarse	5,310	37,900
Bituminous surface-treatment aggregate	2,820	20,300
Railroad ballast	282	2,600
Other graded coarse aggregate	8,840	61,700
Total	19,800	141,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	2,520	18,400
Screening, undesignated	634	4,700
Other fine aggregate	5,610	44,200
Total	8,760	67,200
Coarse and fine aggregates:		
Graded road base or subbase	5,690	35,200
Unpaved road surfacing	342	2,670
Crusher run or fill or waste	1,190	6,220
Other coarse and fine aggregates	9,460	56,600
Total	16,700	101,000
Other construction materials	296	3,130
Agricultural:		
Limestone	573	6,400
Poultry grit and mineral food	(2)	(2)
Other agricultural uses	88	483
Chemical and metallurgical:		
Cement manufacture	5,180	35,800
Lime manufacture	1,190	7,360
Flux stone	227	1,680
Sulfur oxide removal	483	3,440
Total	7,090	48,300
Special:		
Mine dusting or acid water treatment	(2)	(2)
Asphalt fillers or extenders	(2)	(2)
Whiting or whiting substitute	(2)	(2)
Other fillers or extenders	407	4,680
Other miscellaneous uses and specified uses not listed	491	3,680
Unspecified:[3]		
Reported	26,200	187,000
Estimated	25,000	180,000
Total	51,400	368,000
Grand total	111,000	788,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	77	603	452	3,660	916	7,730	3,440	27,700
Coarse aggregate, graded[3]	391	2,570	1,330	9,540	4,440	33,300	13,600	96,000
Fine aggregate (-⅜ inch)[4]	147	970	870	5,990	1,630	12,000	6,110	48,300
Coarse and fine aggregates[5]	352	2,140	1,760	10,700	3,400	21,100	11,200	66,700
Other construction materials	--	--	--	--	26	295	270	2,840
Agricultural[6]	W	W	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	2,160	17,100	3,460	21,900
Special[8]	W	W	W	W	W	W	W	W
Other miscellaneous uses and specified uses not listed	68	509	1	10	422	3,160	--	--
Unspecified:[9]								
Reported	1,490	10,500	3,650	26,100	5,000	35,500	16,100	115,000
Estimated	3,000	22,000	3,700	27,000	3,300	24,000	15,000	110,000
Total	6,990	48,700	11,900	83,300	21,700	159,000	70,200	497,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7] Includes cement and lime manufacture, flux stone, and sulfur oxide removal.

[8] Includes mine dusting or acid water treatment, asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,340	$19,900	$8.52
Plaster and gunite sands	32	369	11.53
Concrete products (blocks, bricks, pipe, decorative, etc.)	34	383	11.26
Asphaltic concrete aggregates and other bituminous mixtures	1,120	8,540	7.63
Road base and coverings	1,330	9,180	6.90
Fill	2,450	12,000	4.92
Snow and ice control	160	841	5.26
Filtration	45	540	12.00
Other miscellaneous uses[2]	408	3,910	9.57
Unspecified:[3]			
Reported	2,430	15,600	6.42
Estimated	8,100	54,900	6.78
Total or average	18,400	126,000	6.84

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes railroad ballast.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1 Quantity	District 1 Value	District 2 Quantity	District 2 Value	District 3 Quantity	District 3 Value
Concrete aggregates and concrete products[2]	695	5,960	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	612	5,290	317	2,040	W	W
Road base and coverings	660	4,590	W	W	W	W
Fill	51	200	184	894	10	38
Snow and ice control	94	510	W	W	W	W
Other miscellaneous uses[3]	161	1,500	849	6,630	882	5,980
Unspecified:[4]						
Reported	41	354	436	3,130	1,160	8,340
Estimated	2,390	16,200	1,390	9,430	3,570	24,200
Total	4,710	34,600	3,180	22,100	5,630	38,600

Use	District 4 Quantity	District 4 Value	Unspecified districts Quantity	Unspecified districts Value
Concrete aggregates and concrete products[2]	583	5,780	1	5
Asphaltic concrete aggregates and other bituminous mixtures	W	W	2	12
Road base and coverings	275	2,090	8	72
Fill	2,180	10,800	22	131
Snow and ice control	W	W	4	24
Other miscellaneous uses[3]	322	3,190	--	--
Unspecified:[4]				
Reported	386	2,990	401	774
Estimated	750	5,080	--	--
Total	4,500	29,900	438	1,020

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

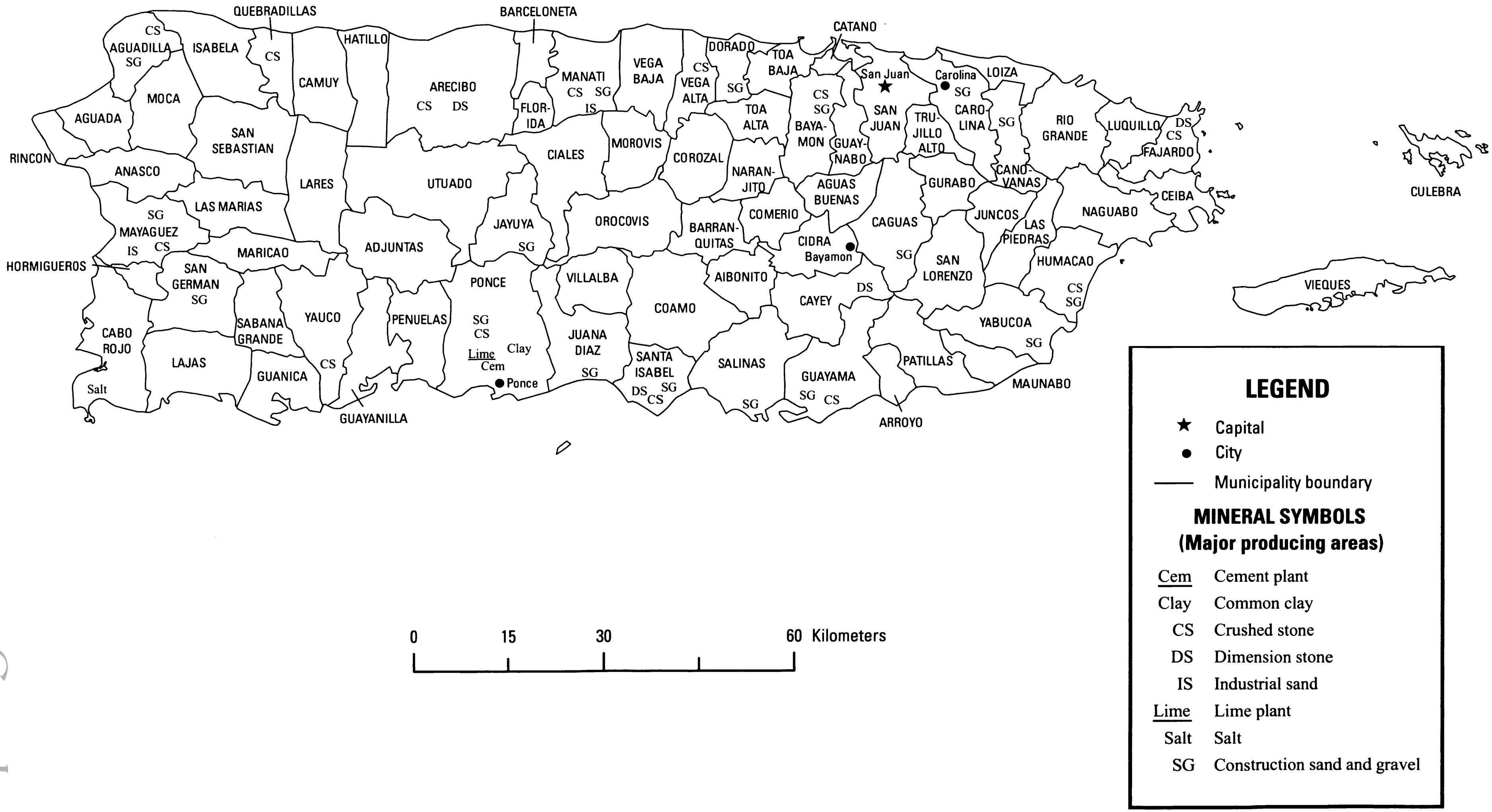
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes filtration and railroad ballast.

[4] Reported and estimated production without a breakdown by end use.

PUERTO RICO



Source: Department of Natural Resources, Commonwealth of Puerto Rico/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF PUERTO RICO AND THE ADMINISTERED ISLANDS[1]

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Puerto Rico Department of Natural and Environmental Resources, Special Services Bureau, Division of Geology, for collecting information on all nonfuel minerals.

In 2006, Puerto Rico's nonfuel raw mineral production[2] was valued at $228 million, based upon annual U.S. Geological Survey (USGS) data. This was a $15 million, or 7%, increase from the $213 million of 2005, which was up $26 million, or by nearly 14%, from 2004 to 2005. If ranked in comparison with the 50 States, Puerto Rico would rank 41st in total nonfuel mineral production value.

Portland cement, by value, continued to be the Commonwealth's leading nonfuel mineral commodity, followed by crushed stone. In 2006, the nonfuel mineral production value of portland cement rose significantly despite a slight decrease in production; the commodity's increase in value accounted for the largest portion of Puerto Rico's increase in nonfuel mineral production value. This was followed by the increase in crushed stone. With a 6% increase in crushed stone production, the mineral commodity's value was up by $5 million, a more than 9% increase (table 1). No decreases took place in any of the Commonwealth's nonfuel mineral commodities production.

In 2006, Puerto Rico produced significant quantities of portland cement; the Commonwealth would rank 20th if ranked in comparison with the 37 producing States. Construction sand and gravel was produced mainly for use as aggregate in concrete and concrete products, as road base materials, and as fill, but production data are not available. The collection and compilation of production data for construction sand and gravel were discontinued by the U.S. Bureau of Mines (the Federal Government Agency then responsible for collecting domestic raw nonfuel mineral production data) because of a substantially low rate of response to surveys by the industry (Sikich and Alonso, 1993).

Of the U.S. Administered Islands, only American Samoa, Guam, and the Virgin Islands recently have reported nonfuel mineral production data, and these have been limited to crushed stone. Crushed stone production and value data for Guam and the U.S. Virgin Islands (limestone and traprock) are shown in table 1. Data for the production of crushed stone for American Samoa (traprock) and the Virgin Islands (2004) have been withheld so as to not disclose company proprietary data.

Reference Cited

Sikich, S.W., and Alonso, R.M., 1993, The mineral industries of Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory: U.S. Bureau of Mines Minerals Yearbook 1992, v. II, p. 467–470.

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[1] While a Memorandum of Understanding (MOU) was officially made between the U.S. Geological Survey (USGS) and the Commonwealth of Puerto Rico, MOUs were not established with the Commonwealth of the Northern Mariana Islands, U.S. Caribbean and Pacific Island Possessions, or the U.S. Trust Territory of the Pacific Islands. Nevertheless, data on nonfuel raw mineral production were reported from several of the Administered Islands to the USGS. Only aggregated crushed stone data for the island of Guam of the Pacific Island Possessions and the same for the U.S. Virgin Islands southeast of Puerto Rico are nonproprietary; these data appear in table 1.

[2] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,580	W	1,580	W	1,550	W
Clays, common	114	585	116	596	111	614
Lime	11	2,250	11	2,250	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	8,660	57,600	8,300 r	55,500	8,790	60,700
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	125,000	XX	153,000	XX	163,000
Total	XX	187,000	XX	213,000 r	XX	228,000
Administered Islands:						
American Samoa, stone, crushed, traprock	W	(3)	W	(3)	W	(3)
Guam, stone, crushed	1,410	13,000	1,410	13,000	900	9,330
Virgin Islands, stone, crushed, limestone and traprock	W	(3)	W	(3)	W	(3)
Total	XX	13,000	XX	15,800	XX	11,300

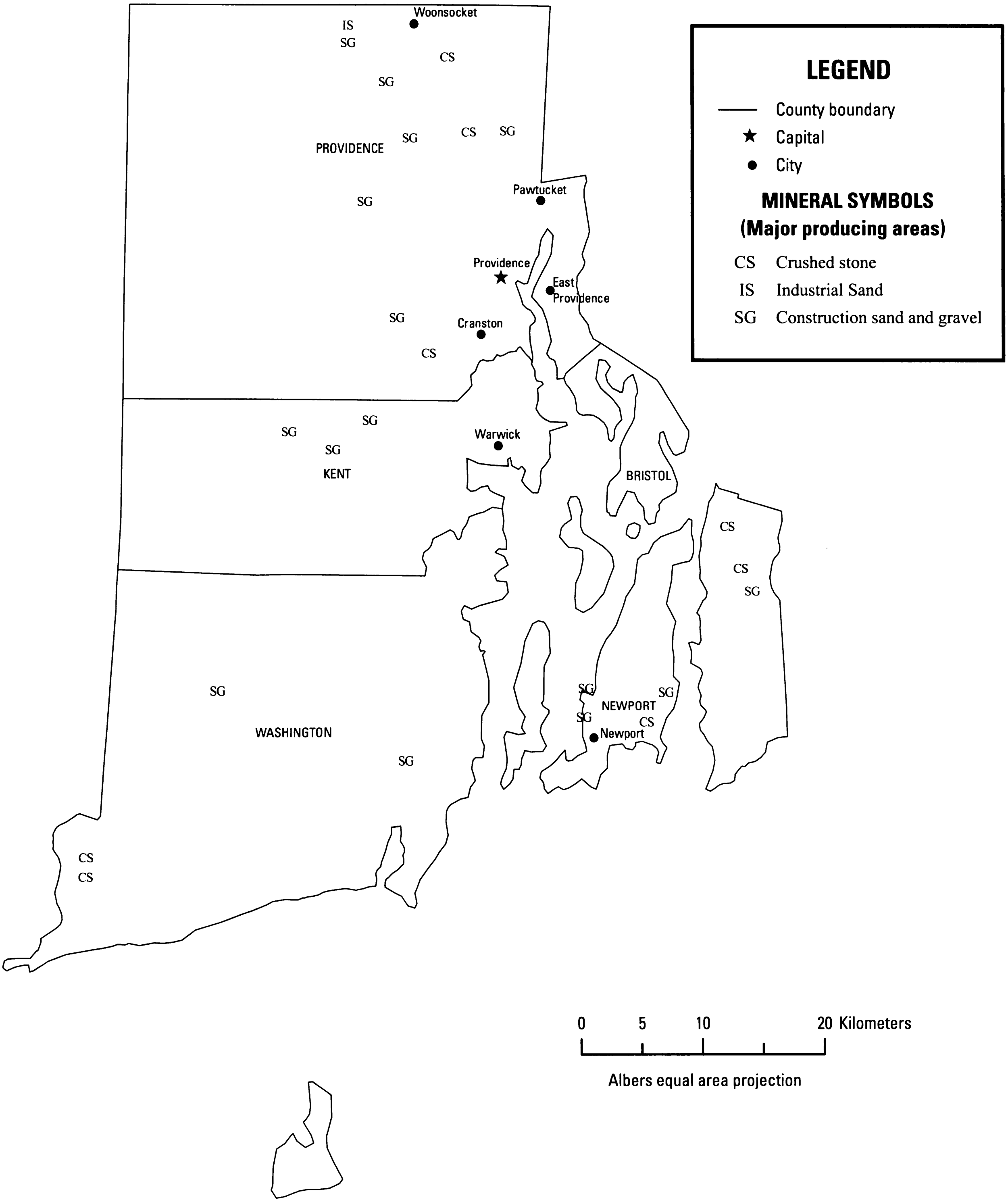
[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Withheld to avoid disclosing company proprietary data.

RHODE ISLAND



Source: Rhode Island Geological Survey/ U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF RHODE ISLAND

In 2006, Rhode Island's nonfuel raw mineral production[1] was valued at $43.7 million, based upon annual U.S. Geological Survey data. This was an $8.4 million, or nearly 24%, increase from the State's total nonfuel mineral value for 2005, which was up about 2.6% from that of 2004. (The data for industrial sand and gravel and crushed limestone are withheld in table 1 (company proprietary data); the actual total values for 2004–06 are higher than those reported in that table.)

Most of Rhode Island's nonfuel mineral production resulted from the mining and production of two basic construction materials—construction sand and gravel and crushed stone. In 2006, these two mineral commodities accounted for 59% and 41%, respectively, of the State's nonfuel mineral economy that may be publicly disclosed. Data for crushed granite and crushed traprock are subdivided in table 2.

In 2006, crushed stone led the State's increase in value with a $5.7 million, or 46%, increase, resulting from a 45% increase in production. Although the production of construction sand and gravel decreased slightly, by about 3%, its value also rose, up by $2.8 million, a 12% increase. Gemstones, the value of which was estimated, continued to be mined in the State only by hobbyists.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN RHODE ISLAND[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	2,490	22,000	2,510	23,000	2,430	25,800
Industrial	W	(3)	W	(3)	W	(3)
Stone, crushed	1,600 [4]	12,400 [4]	1,610 [4]	12,300 [r, 4]	2,320 [4]	18,000 [4]
Total	XX	34,400	XX	35,300 [r]	XX	43,700

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value withheld to avoid disclosing company proprietary data.

[4] Excludes certain stones; value withheld to avoid disclosing company proprietary data.

TABLE 2

RHODE ISLAND: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	1	W	W	1	W	W
Granite	3	455	$3,410 [r]	3	1,110	$8,550
Traprock	3	1,150	8,900 [r]	3	1,220	9,430
Total	XX	1,610	12,300 [r]	XX	2,320	18,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
RHODE ISLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Unspecified:[2]		
Reported	920	7,120
Estimated	1,400	10,900
Total	2,320	18,000

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

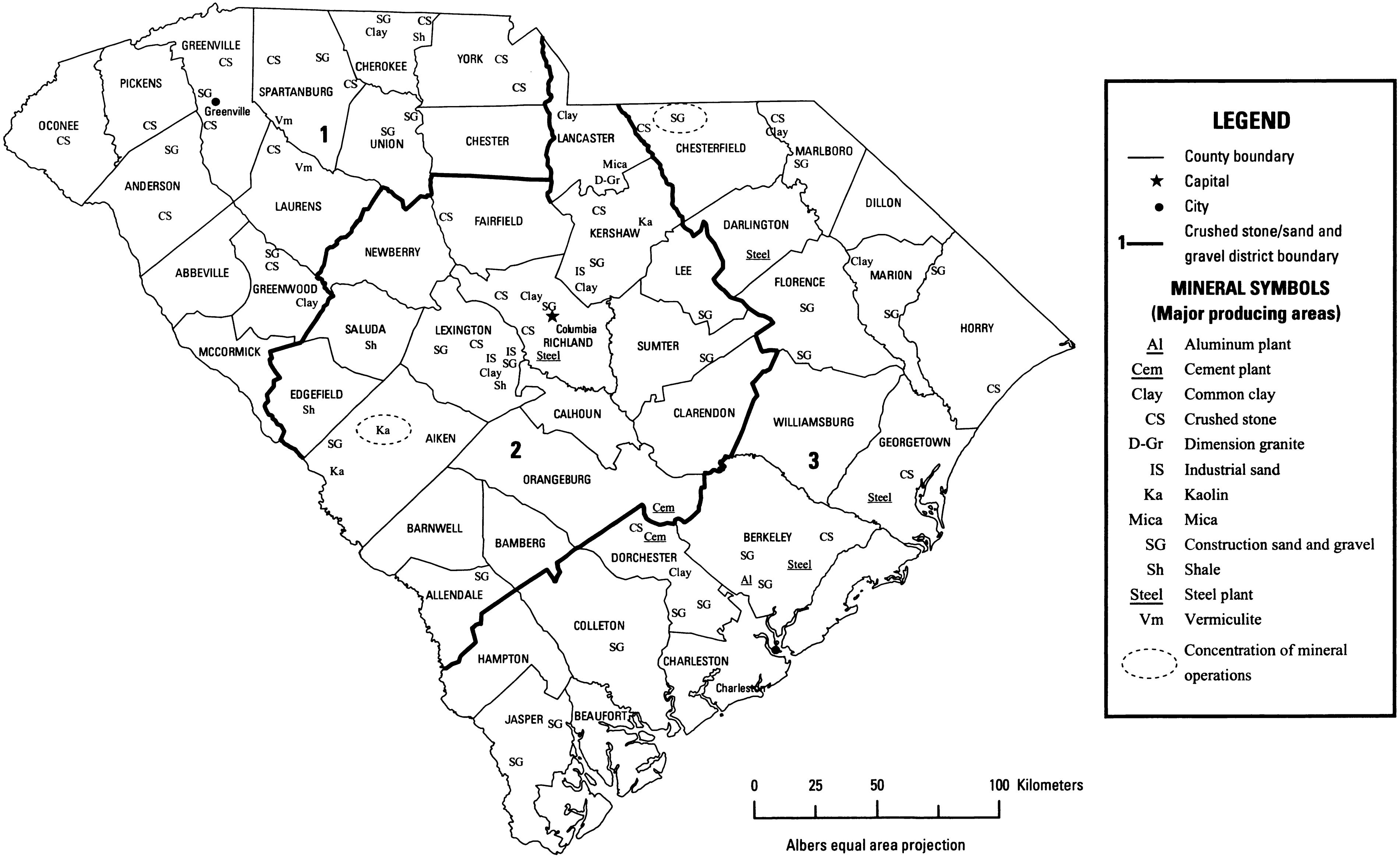
TABLE 4
RHODE ISLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	480	$5,510	$11.00
Road base and coverings	56	536	9.57
Fill	187	1,530	8.18
Snow and ice control	21	292	13.90
Unspecified, estimated[2]	1,690	17,900	10.59
Total or average	2,430	25,800	10.59

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Estimated production without a breakdown by end use.

SOUTH CAROLINA



Source: South Carolina Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF SOUTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2006, South Carolina's nonfuel raw mineral production[1] was valued at $735 million, based upon annual U.S. Geological Survey (USGS) data. This was a $76 million, or an 11.5%, increase from the State's total nonfuel mineral value of $659 million in 2005, which was up by $127 million, or nearly 24% from 2004[2] to 2005. South Carolina was 29th in rank (28th in 2005) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total.

A large majority of South Carolina's nonfuel mineral production resulted from the mining and production of construction minerals and materials. In 2006, cement (portland and masonry), by value, remained the State's leading nonfuel mineral commodity by value of production, followed by crushed stone and construction sand and gravel. These three mineral commodities accounted for nearly 92% of the State's total nonfuel mineral value, followed, in descending order of value, by industrial sand and gravel, kaolin, and crude vermiculite.

In 2006, most of the State's nonfuel mineral commodities increased in value, led in particular by cement. The combined increase in value of masonry cement and portland cement was nearly $62 million. With increases in the production of each, the increase in the quantity of masonry cement produced was the most pronounced, up nearly 16%, as compared with that of portland cement, which had a 2% increase in production. The value of masonry cement rose by 27%, while the value of portland cement was up by 19%.

Smaller increases took place in the values of construction sand and gravel, crushed stone, and industrial sand and gravel, up by nearly $6 million, $3 million, and more than $2 million, respectively. Whereas small to somewhat moderate decreases took place in the production of the former two mineral commodities, industrial sand and gravel production rose by 14% (table1). The production and the related value of crude vermiculite increased, its value rising by about $1 million, and increases also took place in the values of crushed marble and crushed sandstone.

In 2006, South Carolina, of two producing States, continued to rank first in the quantities of vermiculite that it produced, and it remained second in the production of kaolin clay, third in masonry cement, fourth in crude mica, and eighth in the production of portland cement. Although fire clay production rose by more than 10%, it decreased to fourth (from third) of six fire clay-producing States. A small decrease took place in common clay production and the State decreased to ninth from eighth in the quantity of common clay produced. Additionally, the State continued to produce significant quantities of crushed stone, construction sand and gravel, and industrial sand and gravel, as compared with other producing States. Primary aluminum and raw steel also were produced in the State but from raw materials that were acquired from foreign and other domestic sources. South Carolina continued to be fifth of 11 States in the production of primary aluminum in 2006.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Because data for crushed marble, crude mica, and crude vermiculite have been withheld (company proprietary data) for 2004, the actual total value is somewhat higher than that reported in table 1.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH CAROLINA[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	453	49,900 [e]	498	54,300 [e]	575	68,900 [e]
Portland	3,110	196,000 [e]	3,270	247,000 [e]	3,320	294,000 [e]
Clays:						
Common	1,050	3,350	1,020	3,610	992	4,250
Fire	1	64	54	892	60	348
Kaolin	296	19,600	287	17,700	294	17,900
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	9,960	35,100	11,100	45,200	10,900	51,100
Industrial	719	17,600	794	19,400	905	21,800
Stone:						
Crushed	31,300	210,000	33,800 [3]	258,000 [3]	30,400 [3]	261,000 [3]
Dimension	9	850	9	850	9	850
Combined values of mica (crude), stone [crushed marble (2005–06) and curshed stone (2006)], vermiculite (crude)	XX	(4)	XX	12,600	XX	15,200
Total	XX	532,000	XX	659,000	XX	735,000

[e] Estimated. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

[4] Value withheld to avoid disclosing company proprietary data.

TABLE 2
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	3	3,700	$26,200	3	4,110	$30,800
Marble	1	W	W	1	W	W
Calcareous marl	4	4,920	28,200	4	2,750	10,500
Granite	23	25,200	203,000	22	23,500	219,000
Sandstone	--	--	--	1	W	W
Total	XX	33,800	258,000	XX	30,400	261,000

W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	W	W
Other coarse aggregate	355	5,810
Total	660	8,390
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	5,680	72,300
Total	7,040	84,800
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Screening, undesignated	78	517
Other fine aggregate	2,460	18,800
Total	2,540	19,300
Coarse and fine aggregates:		
Graded road base or subbase	(3)	(3)
Crusher run or fill or waste	869	5,710
Other coarse and fine aggregates	5,180	38,400
Total	6,050	44,100
Other construction materials	79	516
Chemical and metallurgical, cement manufacture	(4)	(4)
Unspecified:[5]		
Reported	14,100	103,000
Estimated	53	530
Total	14,000	103,000
Grand total	30,400	261,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	--	--	79	516	--	--
Chemical and metallurgical[6]	--	--	(7)	(7)	(7)	(7)
Unspecified:[8]						
Reported	3,770	32,200	1,170	8,010	9,140	63,100
Estimated	--	--	46	460	7	66
Total	10,800	96,200	7,750	64,500	11,800	99,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes macadam, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (concrete), and other fine aggregates.

[5] Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6] Includes cement manufacture.

[7] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[8] Reported and estimated production without a breakdown by end use.

TABLE 5

SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	5,320	$25,900	$4.87
Asphaltic concrete aggregates and road base materials[3]	325	1,110	3.41
Fill	679	1,580	2.32
Other miscellaneous uses	182	722	3.97
Unspecified:[4]			
Reported	3,320	16,600	5.01
Estimated	1,100	5,140	4.68
Total or average	10,900	51,100	4.68

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products [2]	555	2,320	1,810	7,720	2,700	14,500
Fill	--	--	190	436	471	1,120
Other miscellaneous uses	--	--	--	--	135	496
Unspecified:[3]						
Reported	64	472	--	--	3,250	16,100
Estimated	99	458	185	867	815	3,820
Total	718	3,250	2,180	9,020	7,380	36,000

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products [2]	585	2,540
Fill	18	23
Other miscellaneous uses	47	226
Unspecified:[3]		
Reported	--	--
Estimated	--	--
Total	650	2,790

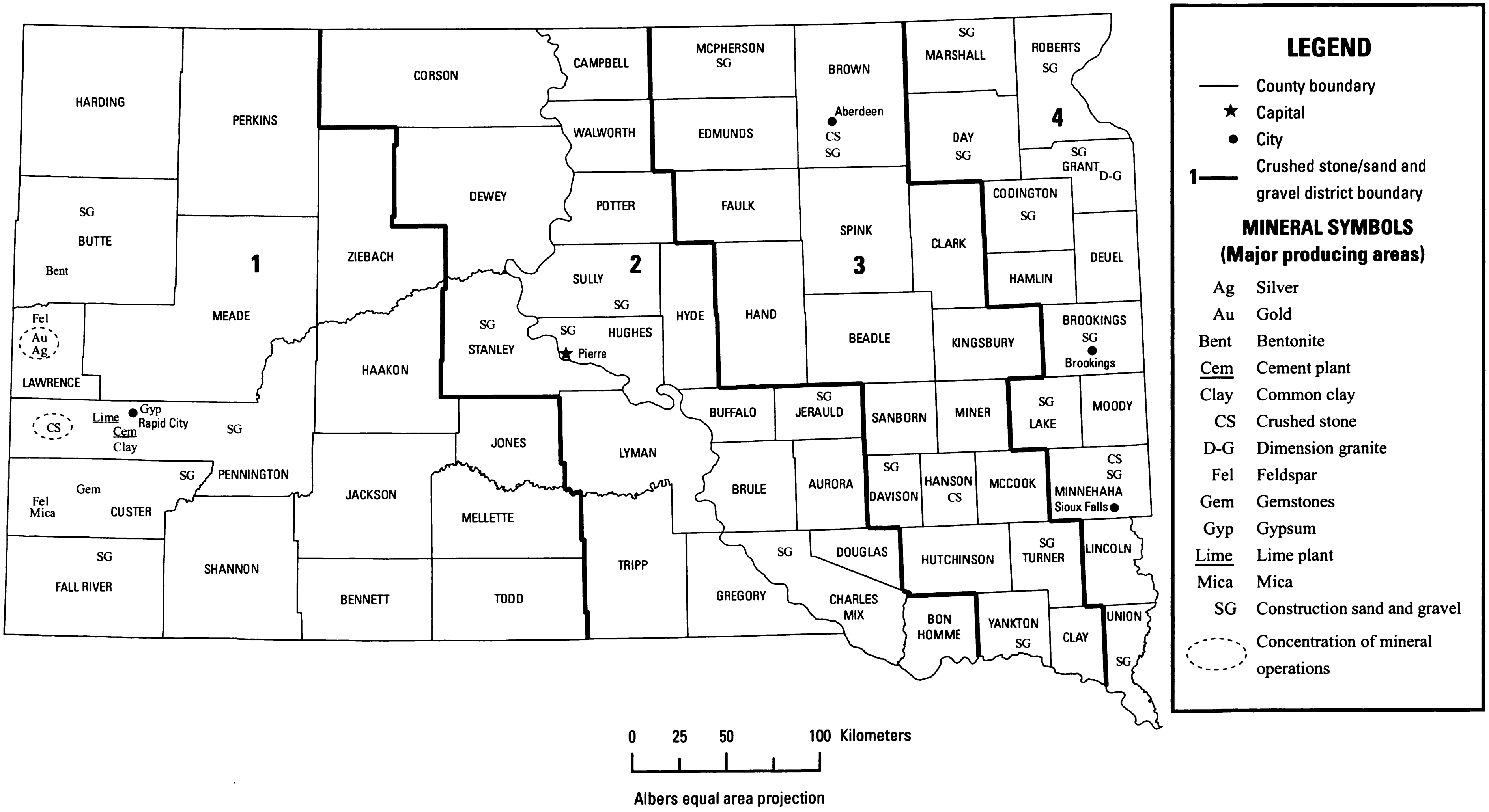
-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands, asphaltic concrete aggregates, road base materials, and road and other stabilization (cement).

[3] Reported and estimated production without a breakdown by end use.

SOUTH DAKOTA



Source: South Dakota Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF SOUTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2006, South Dakota's nonfuel raw mineral production[1] was valued at $223 million, based upon annual U.S. Geological Survey (USGS) data. This was a $6 million, or 2.8%, increase from the State's total nonfuel mineral value for 2005, which also had increased by $6 million from 2004 to 2005. South Dakota ranked 41st among the States in total nonfuel mineral production, yet per capita, the State ranked 14th in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of slightly more than 782,000, the value of production was about $286 per capita.

Portland cement, by value, continued to be South Dakota's leading nonfuel mineral commodity in 2006, after having overtaken gold in 2002; prior to 2002, gold had been the State's leading mineral commodity for more than 4 decades. Portland cement was followed (in descending order of value) by construction sand and gravel, crushed stone, granite dimension stone, gold, and lime. The State's production of construction materials, which mainly included (in descending order of value) portland cement, construction sand and gravel, crushed stone, granite dimension stone, common clays, and gypsum, accounted for nearly 90% of the State's total nonfuel mineral production value.

Construction sand and gravel and portland cement had the largest increases in production value of all the State's nonfuel mineral commodities. A 28% increase in construction sand and gravel production led to a more than $14 million, or 31%, increase in its value. With a somewhat small decrease in production, the value of portland cement also had a significant increase in value. A relatively small decrease in crushed stone production resulted in a $2 million increase in its value. The largest decrease in value took place in gold, which the production also was down significantly (table 1).

In 2006, South Dakota rose in rank to sixth from seventh in the quantity of gold produced of 10 producing States, and it rose to second from third of five mica-producing States while remaining a significant producer of construction sand and gravel and granite dimension stone (10th in rank).

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources (DENR)[2] in cooperation with DENR Geological Survey Program. Production data in the text that follows are those reported by the DENR Minerals and Mining Program (MMP) and are based upon MMP surveys and estimates. Data may differ from some production figures reported to the USGS.

Exploration and Permitting Activities

In 2006, the DENR issued an exploration permit to GCC Dacotah, Inc., a cement production company based in Rapid City. GCC Dacotah planned to explore for limestone reserves within Pennington County in the central Black Hills.

Permit applications were also received by the DENR from two additional companies planning to explore other locations in the Black Hills. Powertech (USA) Inc., Hot Springs, submitted an application in July to explore for uranium resources in an area northwest of Edgemont in the southern Black Hills. Pending issuance of a permit, the company hoped to begin exploration operations in the spring 2007. Capella Resources Ltd., Dartmouth, Nova Scotia, Canada, submitted an application to the DENR for gold exploration in the northern Black Hills. A permit for this activity had not been issued by yearend. Eleven mine permits, covering six large-scale gold mining operations, remained in effect during 2006.

Some gold exploration activity was reported in 2006 following a year in which essentially no exploration was carried out despite rising gold prices. Wharf Resources (USA) Inc., a holder of four gold mining permits, and operator of a large-scale gold mine in the Black Hills, drilled nearly 70 new exploration holes during the year. Two placer gold operations also reported exploration activities.

Commodity Review

Industrial Minerals

Sand and Gravel, Construction and Stone, Crushed.— Sand and gravel remained the major industrial mineral commodity produced during 2006. Based upon data compiled by the MMP, 14.2 million metric tons (Mt) (15.6 million short tons) of sand and gravel was produced in 2006. Sand and gravel was produced throughout the State and was used mainly for road construction.

Limestone became the second leading industrial mineral produced in 2006, reaching 3.6 Mt, and surpassing quartzite production by about 0.56 Mt. Limestone was recovered from the Black Hills of western South Dakota and was used primarily in the production of cement and for construction. Quartzite was quarried from four areas in southeastern South Dakota. Most of the quartzite was crushed and used in construction. Some larger blocks were used for rip-rap, railroad ballast, and occasionally for decorative purposes.

A total of about 258,000 metric tons (t) of dimension stone was mined by Dakota Granite Company and Cold

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] The DENR Minerals and Mining Program in cooperation with DENR Geological Survey Program provided information. E. H. Holm, T. Cline, Jr., and Roberta Fivecoate, Natural Resources Project Engineer, Environmental Project Scientist, and Natural Resources Project Engineer, respectively, with the Minerals and Mining Program, jointly authored the text of information provided by that program.

Spring Granite Company from quarries near Milbank in northeastern South Dakota. The "mahogany" granite mined by these companies exhibits a beauty and distinctive red color and continues to find important applications, primarily in international markets, in the construction of monuments, and various types of building designs.

Other industrial minerals produced in smaller amounts during 2006 included bentonite, gypsum, mica schist, pegmatite minerals (feldspar, mica, rose quartz), shale, and slate. Production of these minerals totaled about 298,000 t, of which 76% was shale.

During the year, 533 companies and individuals held active industrial mining licenses in the State. About 93% of these was involved in the recovery of construction stone, pegmatite minerals, sand and gravel, and materials used in the process for making cement or lime.

Metals

Gold and Silver.—Wharf Resources Inc. reported production of 1,960 kilograms (kg), (63,000 troy ounces) of gold in 2006, a slight increase compared with that of 2005. Wharf Resources' surface heap-leach mine remained as the only large-scale gold mine continuing to operate in the State. In 2005, Homestake Mining Company and LAC Minerals (USA), LLC had reported production of minor quantities of gold, but did not produce any gold in 2006. The average price of gold in 2006 rose to $603.46 per troy ounce, increasing the gross value of the gold produced to about $38 million, an increase of nearly 37% compared with that of 2005.

Wharf Resources' gold recovery process also produced silver as a byproduct. A total of about 5,740 kg (184,545 troy ounces) of silver was recovered in 2006. At an average price of $11.55 per troy ounce, the value of the silver recovered was about $2.13 million, an increase of 74% compared with that of 2005.

Mine Reclamation

In April, the Board of Minerals and Environment granted Homestake Mining's request for partial release of reclamation liability at its Open Cut surface mine in Lead. The 208 hectares (ha) (514 acres) of affected land was the single largest block of acreage the board had ever released from reclamation liability. Under its mining permits, Homestake still had 43.7 ha (108 acres) that needed further reclamation work prior to release of the company's remaining reclamation liability. The board also accepted Homestake's post closure plan and set a 100-year period for post closure care and maintenance. The 100-year period is necessary for long-term water treatment of mine runoff for selenium and total dissolved solids.

Work continued in 2006 on the conversion of the Homestake underground mine into a national underground science laboratory. In May, ownership of the underground mine was transferred from Barrick Gold Corporation, Toronto, Ontario, Canada, to the South Dakota Science and Technology Authority. In June, conceptual designs for a deep underground lab were submitted to the National Science Foundation. The Authority planned to begin rehabilitating the mine shafts and tunnels in 2007 and also to pump water out of the mine in preparation for construction of an interim laboratory.

Environmental Issues

The U.S. Environmental Protection Agency (EPA) continued acid water treatment at the Gilt Edge Superfund Site in 2006. A total of 377 million liters (99.7 million gallons) was treated and discharged in 2006, with plans to continue this water treatment in 2007. The EPA and the State continued to prepare plans to reclaim the rest of the site, including the mine pits and heap-leach pad. A feasibility study outlining reclamation options was scheduled to be completed in October 2007.

The 2006 State Legislature passed a bill authorizing the Board of Minerals and Environment to promulgate rules for the construction, operation, monitoring, and closure of uranium and other in situ leach mines. Passage of this bill was prompted by the growing interest in uranium mining within the State, and the associated possibility that uranium in situ leach mining operations would be carried out. In response to this legislation, a draft set of rules was prepared by the DENR. Following a public hearing, and consideration of comments from the public and the DENR, the Board of Minerals and Environment adopted the newly prepared rules regarding in situ leach mining.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Clays, common	188	W	183	W	176	W
Sand and gravel, construction	14,000	51,700	12,800	45,500	16,400	59,800
Stone, crushed	6,410	27,600	6,740 [r]	32,400 [r]	6,320	34,600
Combined values of cement (portland), feldspar, gemstones (natural), gold, gypsum (crude), iron ore [usable shipped (2005–06)), lime, mica (crude), stone (dimension granite), and values indicated by symbol W	XX	131,000	XX	139,000	XX	129,000
Total	XX	211,000 [r]	XX	217,000 [r]	XX	223,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	6	3,200	$14,800	4	3,240	$14,400
Granite	1	W	W	1	W	W
Quartzite	4	3,300 [r]	16,500 [r]	3	2,870	19,000
Slate	1	W	W	1	W	W
Total	XX	6,740 [r]	32,400 [r]	XX	6,320	34,600

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), other	W	W
Coarse aggregate, graded, other	W	W
Fine aggregate (-⅜ inch), other	W	W
Coarse and fine aggregates, other	W	W
Chemical and metallurgical, cement manufacture	(2)	(2)
Unspecified:[3]		
Reported	3,750	18,200
Estimated	1,400	7,900
Total	5,190	26,100
Grand total	6,320	34,600

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	--	--	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W
Coarse and fine aggregate[6]	--	--	--	--	W	W
Chemical and metallurgical[7]	(8)	(8)	--	--	--	--
Unspecified:[9]						
Reported	2,020	7,700	658	4,580	1,080	5,920
Estimated	1,200	6,700	--	--	220	1,200
Total	3,240	14,400	658	4,580	2,420	15,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 2.

[3] Includes other coarse aggregate.

[4] Includes other graded coarse aggregate.

[5] Includes other fine aggregate.

[6] Includes other coarse and fine aggregates.

[7] Includes cement manufacture.

[8] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[9] Reported and estimated production without a breakdown by end use.

TABLE 5

SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	413	$2,090	$5.05
Asphaltic concrete aggregates and other bituminous mixtures	927	3,250	3.50
Road base and coverings[3]	4,230	14,100	3.34
Fill	458	1,300	2.84
Snow and ice control	16	40	2.50
Other miscellaneous uses	56	591	10.58
Unspecified:[4]			
Reported	1,050	4,430	4.24
Estimated	9,270	34,000	3.67
Total or average	16,400	59,800	3.64

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	W	W	W	W	11	102	319	1,680	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--	W	W	174	383	W	W	--	--
Road base and coverings[3]	W	W	226	741	W	W	3,120	10,600	359	1,190
Fill	(4)	2	18	68	88	228	352	1,010	--	--
Other miscellaneous uses[5]	316	1,100	83	403	239	634	800	3,320	--	--
Unspecified:[6]									--	--
Reported	184	790	74	164	65	281	723	3,200	--	--
Estimated	4,250	15,200	1,540	5,520	970	3,890	2,510	9,330	--	--
Total	4,750	17,100	1,940	6,900	1,550	5,520	7,820	29,100	359	1,190

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

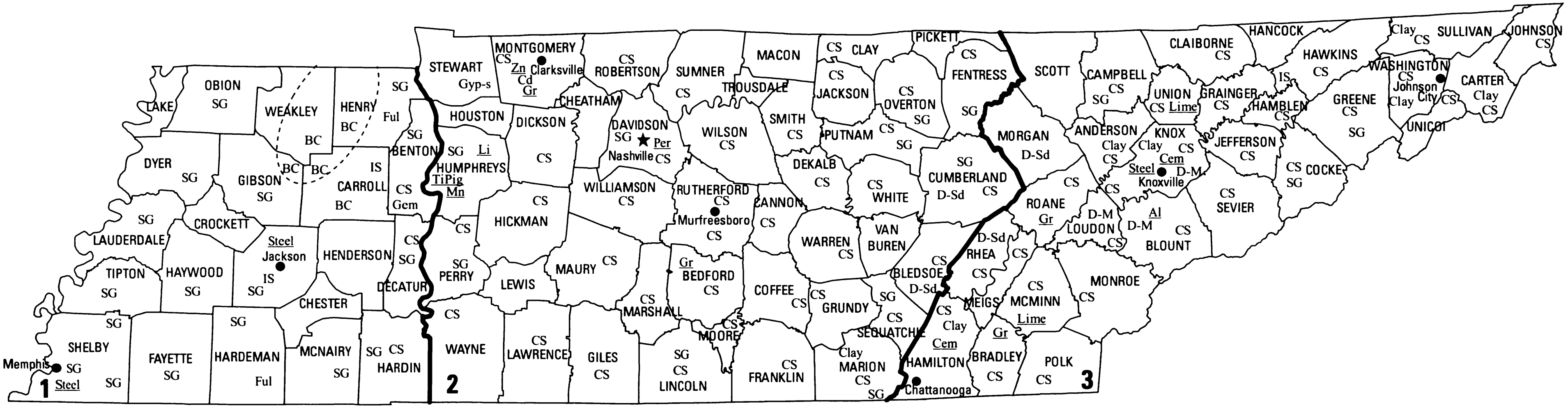
[3] Includes road and other stabilization (cement and lime).

[4] Less than ½ unit.

[5] Includes snow and ice control.

[6] Reported and estimated production without a breakdown by end use.

TENNESSEE



LEGEND

—	County boundary	Cd	Cadmium (byproduct)	IS	Industrial sand
★	Capital	Cem	Cement plant	Li	Lithium plant
●	City	Clay	Common clay	Lime	Lime plant
1—	Crushed stone/sand and gravel district boundary	CS	Crushed stone	Mn	Manganese dioxide plant
		D-M	Dimension marble	Per	Perlite
		D-Sd	Dimension sandstone	SG	Construction sand and gravel
MINERAL SYMBOLS (Major producing areas)		Ful	Fuller's earth	Steel	Steel plant
		Gem	Gemstones	TiPig	Titanium dioxide pigment plant
Al	Aluminum plant	Gr	Graphite plant	Zn	Zinc plant
BC	Ball clay	Gyp-s	Synthetic gypsum	◌	Concentration of mineral operations

Source: Tennessee Department of Environment and Conservation/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Tennessee Department of Environment and Conservation, Division of Geology, for collecting information on all nonfuel minerals.

In 2006, Tennessee's nonfuel raw mineral production[1] was valued at $856 million, based upon annual U.S. Geological Survey (USGS) data. This was an $85 million, or 11%, increase from the State's total nonfuel mineral production value for 2005, following a $119 million, or more than 18%, increase from 2004 to 2005. Tennessee increased to 25th from 26th in rank among the 50 States in total nonfuel mineral production value in 2006 and accounted for about 1.3% of the U.S. total.

Crushed stone has been Tennessee's leading nonfuel mineral commodity, by value, for nearly five decades (except in 1981 when zinc was first); crushed stone went ahead of cement (portland and masonry) in 1957. In 2006, crushed stone accounted for more than 60% of the State's total nonfuel mineral production value. Cement was the second-leading nonfuel mineral commodity, followed by construction sand and gravel, ball clay, industrial sand and gravel, and lime.

In 2006, increases in the mineral production values of cement and crushed stone led Tennessee's increase in total nonfuel mineral production value, the unit values of each also showing significant increases. Cement, with a somewhat small increase in production, led with the largest single increase in value (data withheld—company proprietary data), up nearly 30%. Crushed stone production decreased slightly, yet its resultant value rose by $34 million, or up by 7%. Smaller yet significant increases took place in the values of construction sand and gravel, up by more than $6 million, followed by increases in the production and value of lime and industrial sand and gravel. Several mineral commodities decreased in value, the largest of which were those of gemstones, down 40%, and common clays, down by $1.6 million (down more than 50%) (table 1).

In 2006, Tennessee continued to be the leading ball clay- and gemstone-producing State (gemstones based upon value), as well as 8th in the quantity of fuller's earth produced and 10th in the production of crushed stone. The State remained a producer of substantial quantities of portland cement, industrial sand and gravel, lime, and common clays (in descending order of value). Primary aluminum and raw steel were produced in Tennessee but were processed from materials obtained from other domestic and foreign sources. The State continued to rank 7th in the production of primary aluminum.

The Tennessee Division of Geology[2] (TDG) provided the following narrative information. Data and information in the following text are those reported by the TDG, based upon its own surveys and estimates. By yearend 2006, approximately 328 nonfuel mineral operations were permitted in 82 counties across the State.

Commodity Review

Industrial Minerals

Clay and Shale.—Ball clay and kaolin were mined from the Eocene-age Claiborne and Wilcox Formations in Carroll, Gibson, Henry, and Weakly Counties, northwest Tennessee. Companies operating in the State were Boral Bricks Inc., H. C. Spinks Clay Company Inc. (owned by Franklin Minerals Inc.), Kentucky-Tennessee Clay Co. (a member of IMERYS Minerals Ltd.), Old Hickory Clay Co., and United Clay Product Inc. (owned by Unimin Corp.). Fuller's earth (montmorillonite) was mined in Hardeman County by Moltan Co. and in Henry County by American Colloid Co.

General Shale Brick, Inc. (the U.S. subsidiary of Wienerberger AG located in Vienna, Austria) operated eight shale mines in Anderson, Carter, Knox, Sullivan, and Washington Counties in east Tennessee to supply its brick production plants. Two other companies operated two shale mines in Hamilton and Marion Counties in southeast Tennessee.

Gemstones.—The fresh water pearl was designated the official Tennessee State Gem in 1979. The historic Tennessee River Freshwater Pearl Farm and Museum located in Benton County is the official site of freshwater pearl culturing in the State. The American Pearl Co. operated the only freshwater pearl farm in North America. American Shell Co., Tennessee Shell Co., and The American Pearl Co. exported mollusk shells from the Tennessee River to pearl-producing countries. Approximately 90% of all cultured pearls begin with a mother-of-pearl nucleus taken from the shell of a Tennessee mussel.

Sand and Gravel, Construction.—Construction sand and gravel was produced at 89 sites located in 29 counties and operated by 55 different companies and two county highway departments. Companies operating at least five sites were: Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. located in District 1 (west Tennessee). Industrial sand was mined in Hawkins County by Short Mountain Silica Co. and Fine Sands, LLC. Unimin Corp.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Peter Lemiszki, Chief Geologist with the Tennessee Division of Geology in Knoxville authored the text of the State mineral industry information provided by that agency.

operated two industrial sand mines in Benton County, and Teague Transports, LLC. operated one mine in Madison County.

Stone, Crushed and Dimension.—The crushed stone industry operated 154 quarries in 2006. Dolomite and limestone were produced at 151 quarries and underground mines located primarily in District 2 (middle Tennessee) and District 3 (east Tennessee). Three quarries in Johnson County produced crushed granite and quartzite. Crushed dolomite and limestone were produced in 67 counties by 42 different companies and 15 county highway departments. Vulcan Materials Co. operated 44 quarries in 32 counties, Rogers Group Inc. operated 33 quarries in 28 counties, and Rinker Materials operated 12 quarries in 7 counties.

The Ordovician-age Holston limestone was quarried for dimension marble in Blount, Knox, and Loudon Counties by the Tennessee Marble Co. and Tennessee Valley Marble Inc. Six companies operated eight dimension sandstone quarries in the Pennsylvanian-age Crab Orchard Sandstone in Bledsoe, Cumberland, Morgan, and Rhea Counties.

Other Industrial Minerals.—Synthetic gypsum was produced from Tennessee Valley Authority byproducts at the Allied Custom Gypsum plant in Stewart County. Lime plants operated by Bowater Southern Paper Corp. in McMinn County produced high-calcium quicklime, and Global Stone Tenn-Luttrell Inc. (owned by O-N Minerals a division of Oglebay Norton Co.) in Union County produced high-calcium quicklime and hydrated lime.

Metals

Zinc.—Switzerland-based Glencore International AG purchased the Tennessee Mines Division of Asarco Inc., reviving a zinc mining industry that had been inactive since 2001. The purchase included the underground Young and Coy Mines and the 6,900-metric-ton-per-day Young Mill in Jefferson County, as well as the Immel Mine in Knox County. These mining and milling facilities were to be operated under Glencore as the East Tennessee Zinc Co. The newly formed company expected that mining would be resumed in the first quarter of 2007 (Mining Engineering, 2007).

Zinifex Limited continued to operate the electrolytic zinc plant in Clarksville, Montgomery County, which produced Special High Grade and Continuous Galvanizing Grade zinc metal. The Clarksville plant also produced cadmium and sulfuric acid.

Reference Cited

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Ball	762	34,300	740	32,500	736	32,300
Common	365	3,140	372	3,210	231	1,530
Fuller's earth	W	W	W	W	W	W
Kaolin	W	W	W	W	W	W
Sand and gravel:						
Construction	7,830	47,500	7,570	51,500	8,500	57,900
Industrial	975	26,100	985	26,500	1,010	29,300
Stone, crushed	57,900	381,000	66,500 [r]	483,000 [r]	65,300	517,000
Combined values of cadmium [byproduct in zinc concentrates (2004)], cement, gemstones (natural), lime, salt, stone (dimension marble), zinc (2004), and values indicated by symbol W	XX	160,000	XX	174,000	XX	218,000
Total	XX	652,000	XX	771,000 [r]	XX	856,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

TENNESSEE: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	113 r	65,100 r	$472,000 r	113	63,800	$505,000
Dolomite	1	W	W	1	W	W
Granite	1	W	W	1	W	W
Sandstone	4 r	559	4,910	4	771	6,200
Total	XX	66,500 r	483,000 r	XX	65,300	517,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	403	2,710
Filter stone	96	646
Other coarse aggregate	1,580	12,900
Total	2,080	16,300
Coarse aggregate, graded:		
Concrete aggregate, coarse	446	2,610
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	16,300	140,000
Total	18,700	157,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Other fine aggregate	4,710	42,500
Total	4,890	43,800
Coarse and fine aggregates:		
Graded road base or subbase	805	4,260
Unpaved road surfacing	W	W
Crusher run or fill or waste	642	2,890
Roofing granules	W	W
Other coarse and fine aggregates	15,800	109,000
Total	17,300	117,000
Other construction materials	265	1,780
Agricultural:		
Limestone	(2)	(2)
Poultry grit and mineral food	(2)	(2)
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Flux stone	(2)	(2)
Special:		
Mine dusting or acid water treatment	(2)	(2)
Asphalt fillers or extenders	(2)	(2)
Other fillers of extenders	(2)	(2)
Unspecified:[3]		
Reported	13,100	105,000
Estimated	6,300	47,000
Total	19,500	152,000
Grand total	65,300	517,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	--	--	265	1,780	--	--
Agricultural[6]	W	W	152	1,380	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	W	W	W	W
Unspecified:[9]						
Reported	723	5,810	7,290	58,500	5,140	40,800
Estimated	--	--	4,200	34,000	2,100	13,000
Total	4,330	40,000	33,800	251,000	27,200	226,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes agricultural limestone and poultry grit and mineral food.

[7] Includes cement and lime manufacture and flux stone.

[8] Includes mine dusting or acid water treatment, asphalt fillers or extenders, and other fillers or extenders.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5

TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	2,690	$19,700	$7.30
Asphaltic concrete aggregates and other bituminous mixtures	246	1,360	5.52
Road base and coverings	219	843	3.85
Fill	98	691	7.05
Unspecified:[3]			
Reported	2,120	14,700	6.95
Estimated	3,130	20,700	6.61
Total or average	8,500	57,900	6.82

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,090	$7,200	W	W	W	W
Asphaltic concrete aggregates and road base materials	312	1,210	W	W	W	W
Fill	92	658	6	32	--	--
Unspecified:[3]						
Reported	1,920	13,600	196	1,110		
Estimated	1,790	11,800	686	4,540	653	4,320
Total or average	5,200	34,500	2,040	13,800	1,260	9,620

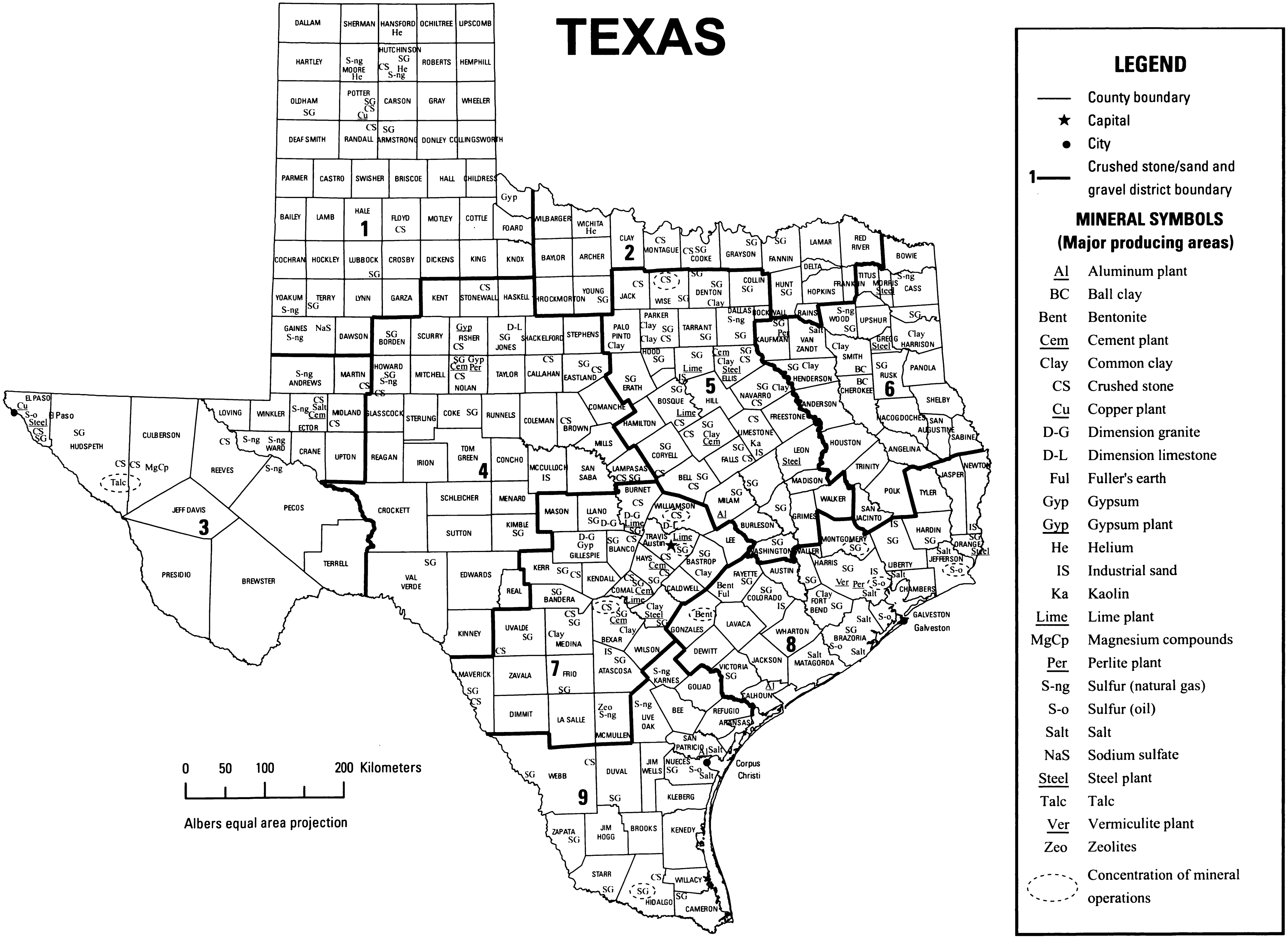
W Withheld to avoid disclosing company proprietary data; included in "Total or average." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Reported and estimated production without a breakdown by end use.

TEXAS



Source: University of Texas at Austin, Bureau of Economic Geology/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF TEXAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Texas at Austin, Bureau of Economic Geology, for collecting information on all nonfuel minerals.

In 2006, Texas nonfuel raw mineral production[1] was valued at $2.98 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 9.6% increase from the State's total nonfuel mineral value of $2.72 billion for 2005, which followed a $390 million, or 16.7%, increase from 2004 to 2005. Texas was seventh among the 50 States (sixth in 2005) in total nonfuel mineral production value and accounted for about 4.5% of the U.S. total value.

In 2006, more than 96% of Texas' nonfuel mineral value resulted from the production of the State's top six industrial minerals, which are, in descending order of value—cement (portland and masonry), crushed stone, construction sand and gravel, salt, lime, and industrial sand and gravel. Cement alone accounted for about 38% of Texas' total nonfuel mineral value and together with the State's other two major construction nonfuel minerals, crushed stone and construction sand and gravel, accounted for more than 85% of the same total value. Nearly every one of the State's nonfuel mineral commodities increased in total production value in 2006. Leading the way with the largest increases in value were construction sand and gravel, up by $131 million, and cement, up by about $121 million (portland cement alone, up by $119 million). A 23% increase in construction sand and gravel production along with a modest increase in the mineral commodity's average unit value resulted in a 28% increase in its total production value. The total production value of cement rose by about 12%, despite a more than 2.5% decrease in the quantity produced. Other mineral commodities that had increases in production and total value were lime, value up by $18 million; Grade–A helium, up by more than $14 million; and salt, up by $14 million (production down slightly). Smaller increases of $1 million or more, in descending order of change, took place in the values of crushed stone, common clays, bentonite clay, and crude helium. The most substantial decrease in value took place in that of industrial sand and gravel. A $48 million decrease in its total production value was the result of a 46% decrease in production. Also down slightly were the production and resultant values of brucite and zeolites (table 1).

In 2006, Texas was the only State that produced brucite, and it continued to be first in rank among producing States in the quantities of crushed stone and common clays produced; second in the production of salt, crude helium (of two producing States), ball clay, and talc (listed in descending order of value); fifth in lime; and seventh in masonry cement. The State rose in rank to first from second in the production of portland cement, to second from third in construction sand and gravel, to second from third in zeolites, to sixth from seventh each in crude gypsum and bentonite clay. Also, Texas was a significant producer of gemstones, being 14th in rank based upon value). Decreases took place in the State ranking in the production of industrial sand and gravel, to 7th from 2d, and in dimension stone, to 13th from 7th. The Texas metal industry produced primary aluminum, raw steel, refined copper, and smaller amounts of other metals. Sources of plant feed included ores, blister and anode copper, and scrap metal acquired from foreign or other domestic sources. In 2006, the State continued to be third in rank in primary aluminum production and was the leading producer of electrolytically refined copper. Texas also remained one of the Nation's leading raw steel-producing States (precise rank withheld—data combined with that of other States to conceal proprietary data). Production of raw steel increased by about 7.7% in 2006 with an output of 3.78 million metric tons (Mt), up from 3.51 Mt in 2005, as reported by the American Iron and Steel Institute (2007, p. 74).

The following narrative information includes information provided by the Texas Bureau of Economic Geology[2] (BEG). In 2006, the mineral industry, as was monitored by the BEG, remained a significant and diverse component of the Texas economy as evidenced by the increased production and values of most of the State's nonfuel minerals from those of 2005. Annual job growth in natural resources and mining, as reported by the Texas Workforce Commission (Texas Workforce Commission, 2007, p. 1), increased 6.9% from December 2005 through December 2006. This number includes mining and support services for nonfuel minerals as well as oil and gas extraction and coal mining. Steadily increasing gains were made in the growth of construction industry employment. The Commission reported an increase of about 7.7% in the number of construction industry jobs Statewide in 2006 compared with those of 2005, showing continued growth from the 3.2% increase of 2005 and the 1.2% increase during 2004 compared with those of the previous year.

Commodity Review

Industrial Minerals

Aggregate reserves continued to be acquired in 2006, with many companies investing capital in future or replacement reserves, but no major company mergers or acquisitions took place in the aggregate industry (Clift and Kyle, 2007, p. 114).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Sigrid J. Clift, Research Associate, Texas Bureau of Economic Geology, and J. Richard Kyle, Professor, Department of Geological Sciences, both of the John A. and Katherine G. Jackson School of Geosciences, University of Texas at Austin, coauthored the text of the State mineral industry information provided by the Texas Bureau of Economic Geology.

Cement.—A joint-venture cement terminal project was completed and opened in Houston by Alamo Cement Co., Ash Grove Cement Co., and Texas Lehigh Cement Co., LP, and was managed under the partnership's company name Houston Cement Co. The port of Houston Cement Terminal, which included the preexisting terminal of North Texas Cement Co. (owned by Ash Grove Cement), was designed to import and distribute 1.5 million metric tons per year of cement and featured six 57 meter-high (186 foot-high) concrete silos and was the largest capacity cement ship unloader operating in the United States. Construction of the project was conducted through a partnership between River Management, Consulting and Engineering Services, Co. (project design and engineering) and Continental Construction Co. with the two developing an efficient facility layout in conjunction with engineers at Ash Grove (Amburgey, 2007, p. 1–2).

Frontier Materials Concrete opened a new facility along the San Jacinto River near Conroe in Montgomery County. Two of the State's cement companies announced plans to increase cement production—TXI (Texas Industries, Inc.) at its Hunter plant and CEMEX USA at its New Braunfels plant—both plants are located between Austin and San Antonio (Clift and Kyle, 2007, p. 114).

Sand and Gravel, Construction.—Vulcan Materials Co. opened a new sand and gravel plant on the Brazos River west of Houston in Fort Bend County. Trinity Materials Inc. opened a new sand and gravel facility in Kaufman County and another in Liberty County. In 2006, U.S. Concrete, Inc. acquired Breckenridge Ready-Mix, Inc., which it added to its existing Ingram Enterprises, Inc. operations in west Texas (U.S. Concrete, Inc., 2006). Near the end of 2005, U.S. Concrete acquired all the operating assets of Go-Crete and South Loop Development Corp., which produce and deliver ready-mixed concrete from six plants and mine sand and gravel from a quarry in the greater Dallas/Ft. Worth, TX, market (U.S. Concrete, Inc., 2005).

Stone, Crushed.—Rail shipments via "rocktimization" efforts of the railroads became more efficient and rock shortages in the Houston market decreased. Rocktimization, a trademark program of Union Pacific Railroad Corp., is a mined product-to-market program designed to produce valuable benefits in shipment sizes, network fluidity, and productivity in transporting aggregates for many customers. Through network investments and reduced train starts, it is designed to create a higher velocity of materials and shorter cycle time of material transported (Union Pacific Corp., 2009).

Lattimore Materials Co. LP closed its limestone crushing plant in Wise County, TX. Capital Aggregates Ltd. began an expansion of crushed stone operations in Burnet County in a joint-venture project with ChemLime.

Reclamation Awards

The U.S. Department of the Interior's Office of Surface Mining (OSM) in its Reclamation Awards for 2006 recognized the Oak Hill Mine (TXU Mining Co.) in East Texas with the Directors Award and the Sandow Mine (Alcoa) the National Award. The Director's Award, the OSM's highest honor for a mining company, was given to TXU Mining for the company's commitment to outstanding innovative reclamation practices at Oak Hill (TXU Mining Co., 2006). Alcoa received the 2006 National Award for Excellence in Surface Mining for its land reclamation accomplishments at the Sandow Mine in Rockdale in central eastern Texas (Alcoa, Inc., 2006).

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN TEXAS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	319	38,000 [e]	395	48,500 [e]	382	50,700 [e]
Portland	11,200	800,000 [e]	11,600	951,000 [e]	11,300	1,070,000 [e]
Clays:						
Ball	W	W	W	7,730	W	W
Bentonite	W	W	W	W	71	2,300
Common	2,160	8,890	2,340	8,680	2,360	12,600
Gemstones, natural	NA	201	NA	201	NA	202
Gypsum, crude	2,450	18,800	1,540	11,800	1,430	11,800
Lime	1,630	115,000	1,610	112,000	1,650	130,000
Salt	9,780 [r]	118,000	9,600	118,000	9,570	132,000
Sand and gravel:						
Construction	81,700	436,000	80,700	472,000	99,500	603,000
Industrial	2,790	109,000	2,840	114,000	1,530	65,600
Stone:						
Crushed	122,000	621,000	137,000 [r]	820,000 [r]	136,000	824,000
Dimension	64	15,200	44	12,200	31	12,600
Talc, crude	258	W	W	W	W	W
Combined values of brucite, clays (fuller's earth, kaolin) helium, zeolites, and values indicated by the symbol W	XX	46,300	XX	41,500 [r]	XX	68,200
Total	XX	2,330,000	XX	2,720,000	XX	2,980,000

[e] Estimated. [r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

TEXAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	115 [r]	132,000 [r]	$785,000 [r]	125	131,000	$787,000
Dolomite	1	W	W	1	W	W
Calcareous Marl	1	21	125	2	1,160	7,170
Marble	4 [r]	122 [r]	1,620 [r]	4	148	1,970
Shell	(3)	W	W	(3)	W	W
Granite	2 [r]	W	W	2	W	W
Traprock	1	W	W	1	W	W
Sandstone and quartzite	4	857	7,420	4	708	5,480
Volcanic cinder and scoria	1	W	W	--	--	--
Miscellaneous stone	12 [r]	2,320 [r]	13,700 [r]	12	2,470	14,800
Total	XX	137,000 [r]	820,000 [r]	XX	136,000	824,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

[3] Sales/distribution yards.

TABLE 3

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	327	2,860
Filter stone	410	3,050
Other coarse aggregate	1,590	23,100
Total	2,330	29,000
Coarse aggregate, graded:		
Concrete aggregate, coarse	5,780	39,200
Bituminous aggregate, coarse	3,020	21,600
Bituminous surface-treatment aggregate	143	1,270
Railroad ballast	W	W
Other graded coarse aggregate	8,560	81,500
Total	17,500	144,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	1,510	8,770
Stone sand, bituminous mix or seal	437	3,040
Screening, undesignated	1,230	3,110
Other fine aggregate	1,750	11,600
Total	4,930	26,500
Coarse and fine aggregates:		
Graded road base or subbase	10,300	45,400
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	1,890	5,240
Other coarse and fine aggregates	11,100	64,100
Total	23,200	115,000
Other construction materials[3]	216	1,700
Agricultural:		
Limestone	(4)	(4)
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	8	79
Chemical and metallurgical:		
Cement manufacture	10,900	30,600
Lime manufacture	(4)	(4)
Sulfur oxide removal	(4)	(4)
Special:		
Asphalt fillers or extenders	(4)	(4)
Other fillers or extenders	987	11,600
Other miscellaneous uses and other specified uses not listed	9	104
Unspecified:[5]		
Reported	47,400	291,000
Estimated	27,000	160,000
Total	74,100	450,000
Grand total	136,000	824,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3] Includes pipe bedding.

[4] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5] Reported and estimated production without a breakdown by end use.

TABLE 4

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2[2]		Districts 3 and 4[2]		Districts 5 and 6[2]		Districts 7, 8, and 9[2]		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[3]	--	--	W	W	W	W	1,950	26,000	--	--
Coarse aggregate, graded[4]	223	2,650	1,910	15,800	1,520	13,900	13,800	111,000	23	461
Fine aggregate (-⅜ inch)[5]	W	W	W	W	1,040	3,630	3,380	19,300	--	--
Coarse and fine aggregates[6]	173	826	1,620	10,100	3,080	14,700	18,100	84,700	294	4,380
Other construction materials[7]	--	--	194	1,560	--	--	22	132	--	--
Agricultural[8]	W	W	--	--	W	W	W	W	--	--
Chemical and metallurgical[9]	--	--	--	--	W	W	W	W	--	--
Special[10]	--	--	--	--	W	W	W	W	--	--
Other miscellaneous uses	--	--	--	--	9	104	--	--	--	--
Unspecified:[11]										
Reported	--	--	633	3,910	20,500	125,000	26,300	162,000	--	--
Estimated	460	2,900	3,700	23,000	8,100	50,000	14,000	83,000	--	--
Total	909	6,540	8,640	58,500	44,300	253,000	81,900	500,000	317	4,840

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Districts 1 and 2, 3 and 4, 5 and 6, and 7, 8, and 9 are combined to avoid disclosing company proprietary data.

[3] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[4] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6] Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[7] Includes pipe bedding.

[8] Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[9] Includes cement and lime manufacture and sulfur oxide removal.

[10] Includes asphalt fillers or extenders and other fillers or extenders.

[11] Reported and estimated production without a breakdown by end use.

TABLE 5

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	31,900	$212,000	$6.64
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	1,160	7,100	6.14
Asphaltic concrete aggregates and other bituminous mixtures	883	7,330	8.31
Road base and coverings	3,830	19,700	5.16
Road and other stabilization (cement and lime)	1,090	8,900	8.17
Fill	5,690	15,900	2.79
Snow and ice control	14	75	5.36
Roofing granules	38	549	14.45
Other miscellaneous uses[3]	144	1,990	13.82
Unspecified:[4]			
Reported	16,100	98,100	6.11
Estimated	38,800	232,000	5.98
Total or average	99,500	603,000	6.06

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes golf course.

[4] Reported and estimated production without a breakdown by end use.

TABLE 6

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5		District 6		District 7		District 8		District 9		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	887	8,800	2,030	12,800	W	W	W	W	7,000	47,400	W	W	3,900	25,800	14,200	83,600	W	W	--	--
Asphaltic concrete aggregates and road base materials[3]	333	5,290	W	W	W	W	--	--	1,150	6,930	W	W	1,090	4,670	2,530	14,600	W	W	--	--
Fill	110	595	641	1,040	W	W	W	W	2,020	5,800	W	W	651	3,070	2,040	4,900	W	W	--	--
Other miscellaneous uses[4]	--	--	124	587	721	4,630	239	1,460	39	564	609	3,930	61	254	41	1,350	4,280	34,800	--	--
Unspecified:[5]																				
Reported	72	467	--	--	2	14	--	--	2,520	12,500	--	--	4,680	31,300	8,470	51,800	--	--	314	2,040
Estimated	5,340	32,100	1,310	7,890	828	4,980	1,950	11,700	11,500	68,100	1,870	11,200	3,680	21,700	6,740	40,500	5,590	33,600	--	--
Total	6,740	47,200	4,110	22,300	1,550	9,620	2,190	13,200	24,200	141,000	2,480	15,200	14,100	86,900	34,000	197,000	9,860	68,300	314	2,040

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

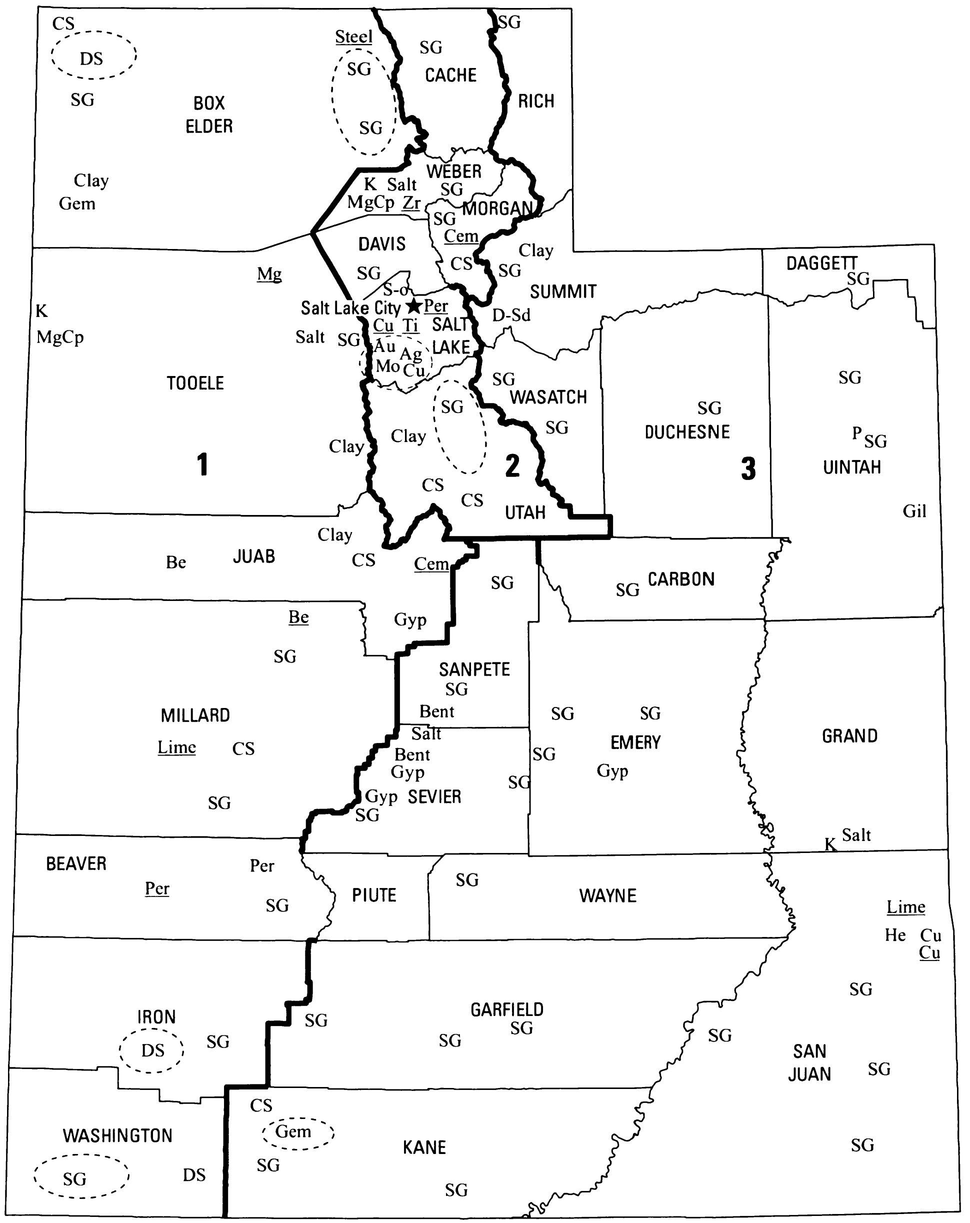
[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement and lime).

[4] Includes golf course, roofing granules, and snow and ice control.

[5] Reported and estimated production without a breakdown by end use.

UTAH

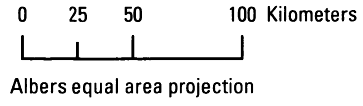


LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper
DS	Dimension stone
D-Sd	Dimension sandstone
Gem	Gemstones
Gil	Gilsonite
Gyp	Gypsum
Gyp	Gypsum plant
He	Helium
K	Potash
Lime	Lime plant
Mg	Magnesium metal plant
MgCp	Magnesium compounds
Mo	Molybdenum
P	Phosphate rock
Per	Perlite
Per	Perlite
Salt	Salt
SG	Construction sand and gravel
S-o	Sulfur (oil)
Steel	Steel plant
Ti	Titanium metal plant
Zr	Zirconium metal plant
◌	Concentration of mineral operations



Albers equal area projection

Source: Utah Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey for collecting information on all nonfuel minerals.

In 2006, Utah's nonfuel raw mineral production was valued[1] at $3.96 billion, based upon annual U.S. Geological Survey (USGS) data. This was an $1.16 billion, or more than 41%, increase from the State's total nonfuel mineral value of $2.80 billion in 2005, which was up $850 million, or up almost 44%, from that of 2004. The State rose to 4th from 5th in rank among the 50 States in total nonfuel mineral production value and accounted for 6% of the U.S. total value.

Metals accounted for nearly 80% of Utah's nonfuel mineral production value, and copper, molybdenum concentrates, and gold (descending order of value) accounted for about 95% of the State's entire metal value. In 2006, substantial increases in the production values of copper, gold, and construction sand and gravel—up more than $1 billion, more than $100 million, and $34 million, respectively—led the State's increase in nonfuel mineral production value. Each of the three had relatively moderate increases in production, and the first two had substantial increases in their average annual unit values, the largest being in copper followed by gold. The smallest was a 9% increase in the average unit value of construction sand and gravel (table 1).

Other mineral commodities with significant increases in value in 2006 were silver and salt, up more than $17 million each, portland cement and potash, up about $13 million each, crushed stone, up by nearly $8 million, and common clays, up by $4 million. The largest decreases in value took place in molybdenum concentrates and magnesium metal, down about 10% each. The production of both mineral commodities moderately increased, but significant decreases also took place in the average unit values of each. Smaller yet significant decreases also took place in the values of bentonite and phosphate rock. Although on a much smaller scale than that of the leading nonfuel mineral commodities, a moderate increase in bentonite production resulted in a 50% decrease in its value for the year (table 1).

In 2006, Utah continued to be the only State to produce magnesium metal and beryllium concentrates (descending order of value), and it remained first in State ranking in the quantity of molybdenum concentrates produced; second in copper, gold, potash, and magnesium compounds (in descending order of value); 4th in silver, phosphate rock, and crude perlite; and fifth in bentonite. Utah rose to 5th from 6th in salt production and to 10th from 12th in the production of lime. Additionally, the State was a producer of significant quantities of construction sand and gravel, portland cement, crushed stone, common clays, and gemstones (gemstones 13th based upon value).

The Utah Geological Survey[2] (UGS) provided the following narrative information. UGS production data were based upon its surveys, estimates, and information gathered from company annual reports. These data may differ from some USGS annual production figures, which were based upon USGS company surveys and estimates.

Exploration and Development Activities

Mineral exploration statewide increased in 2006. During 2006, the Utah Division of Oil, Gas and Mining (DOGM) received 5 large mine permit applications, 41 new small mine permit applications, and 35 notices of intent to explore on public lands. More than 6,000 new Federal unpatented mining claims were recorded in 2006. The Utah School and Institutional Trust Lands Administration generated record revenues in fiscal year 2006.

Bingham District

Kennecott Utah Copper Corporation's (KUC) Bingham Canyon Mine earned a record $1.8 billion in 2006 as a result of increased copper, gold, and silver prices and a continued strong molybdenum price. KUC produced a record quantity of molybdenum in 2006 and also increased copper and gold production as a result of the mining of higher-grade ores. The company was in the third year of a program to expand mine reserves with efforts during 2006 focused on extending the mine life beyond the year 2017. As part of the expansion program, alternatives under consideration included various underground mining options or the laying back of additional overburden at the open pit operation.

Development work at Bingham Canyon included an upgrade of the molybdenum recovery circuit and the commissioning of a pebble crushing unit. Other major work during the year included the initial driving of a horseshoe-shaped drainage tunnel from near the bottom of the pit to a location southwest of the pit.

KUC continued its brownfield exploration at Bingham Canyon including substantial efforts at examining high-grade molybdenum areas, copper porphyry roots, and skarn zones below the currently defined pit. These efforts included more than 30,000 meters (m) of development drilling completed in 2006 (Michael Penick, Geological Services Superintendent, KUC, written commun., February 2007). Plans for 2007 included the re-excavation of the North Ore Shoot shaft collar, which was buried by previously mined material.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Kenneth Krahulec, Geologist, and Roger Bon, Industry Outreach Specialist, of the Utah Geological Survey authored the text of the State mineral industry information provided by that State agency.

Kennecott Exploration Co. continued its exploration of the Stockton porphyry copper system about 16 kilometers (km) southwest of Bingham Canyon. Kennecott performed detailed geologic mapping, geochemical sampling, a gravity survey, a three-dimensional induced polarization survey, a ground magnetic survey, and digital mapping of the 56 km of underground development. The company also conducted exploratory drilling, completing three new core holes totaling about 1,700 m (Joey Wilkins, company official, KUC, written commun., March 2007).

Fish Springs District

In 2006, Lithic Resources Ltd., Vancouver, British Columbia, Canada, completed an aerial magnetic survey of the Crypto zinc skarn in the Fish Springs mining district of western Juab County, and an aerial photographic description of the general property area. Lithic had acquired the Crypto property in 2005. Cyprus Amax Minerals Company had explored the property in 1993 and had estimated that a shallow oxide resource of 2.8 million metric tons (Mt) averaging 7% zinc and a deep sulfide resource of 5.4 Mt averaging 8.8% zinc existed at Crypto. Lithic planned to conduct a 10,000-m drilling program in 2007, the main objective of which would be to expand the current zinc resource estimates of the Crypto deposit (Chris Staargaard, President, CEO, Lithic Resources Ltd., written commun., February 2007).

Studies to define silver mineralization at the Silver Dome property, 760 hectares (ha) of land south of the Crypto zinc skarn, were carried out in 2006. The property is controlled by Columbus Gold Corporation, Vancouver, British Columbia, Canada. Mineralization at Silver Dome occurs in flat-lying, Ordovician, calcareous sandstones as fine-grained, argentiferous galena, both disseminated and along high-angle structures. During 2006 initial mapping identified widespread silver mineralization. Sampling of the mineralization yielded grades of up to 2.7 kilograms per metric ton (79 troy ounces per short ton) of silver. Columbus Gold has targeted the identification of a bulk-minable silver zone amenable to open pit development (Columbus Gold Corporation, 2007). More detailed geologic mapping, sampling, and trial geophysical surveys were planned to further delineate mineralization on the property.

Gold Hill District

Dumont Nickel Inc., Toronto, Ontario, Canada, continued its exploration efforts in the Gold Hill mining district in southwestern Tooele County. During the year, four reverse circulation (RC) holes were drilled in the Kiewit gold zone, seven RC holes were drilled in the Kiewit West target, and an additional seven shallow holes were drilled in the Cane Springs property. In late 2006, Dumont discovered a sediment-hosted gold system, the Rattler project, in the northwestern portion of its Gold Hill properties. The company planned to include drill testing of the Rattler project in its 2007 exploration program (Dumont Nickel Inc., 2006).

Gold Springs District

Astral Mining Corporation, Vancouver, British Columbia, Canada, drilled 10 RC holes totaling about 1,800 m on a low-sulfidation, epithermal, gold-silver quartz vein swarm at its Gold Springs property. The Gold Springs mining district is located on the Nevada-Utah border in southwestern Utah. The best intersect contained 6.1 m of 7.2 parts per million (ppm) gold and 29 ppm silver at a depth of 26 m. A 1,500-m core-drilling program was planned for 2007 at Gold Springs (Astral Mining Corporation, 2006).

Iron Springs District

In 2006, Palladon Iron Corporation (a subsidiary of Palladon Ventures Ltd., Salt Lake City) digitized the drilling exploration data accumulated at the Iron Mountain project by its former owner, Geneva Steel. In addition, Palladon began engineering and metallurgical studies for a new mill and concentrator, refurbished a ball mill system, demolished all of the existing structures on the mill site, and constructed an interchange track with the Union Pacific Railroad for shipping ore to a port in California for processing in China. Palladon had acquired the Iron Mountain property in 2005. The property, formerly the Comstock-Mountain Lion open pit operation, hosts an estimated resource of about 30 Mt averaging 47% iron (Palladon Ventures Ltd., 2006).

Kings Canyon Area

Maestro Ventures Ltd., Vancouver, British Columbia, Canada, acquired the Kings Canyon sediment-hosted gold property in southwestern Millard County. The property had been explored in the early 1990s, primarily by Crown Resources. The property reportedly contains several gold zones including a potential resource containing about 6.2 Mt, averaging 1 ppm gold (Palladon Ventures Ltd., 2007).

Lisbon Valley District

Constellation Copper Corporation, Denver, CO (through its wholly owned subsidiary Lisbon Valley Mining Company LLC) completed construction at its new open pit, heap-leach, solvent extraction-electrowinning (SX-EW) copper operation in 2006. The SX circuit was commissioned in March and the first EW cathodes were produced in April. Startup problems in the operation were encountered throughout the remainder of the year as efforts continued toward full production. Copper cathode production was 5,300 metric tons (t) in 2006. However, by yearend, production was increased to about 900 metric tons per month. Copper at Lisbon Valley occurs as disseminated and fracture-controlled mineralization in Cretaceous sandstones along the nose of a salt-cored anticline.

Exploration by Lisbon Valley during 2006 focused on evaluating the Flying Diamond deposit, located southeast of the open pit operation. Drilling tests in 2006 expanded on the original 13 holes drilled in 2005 and included 24 core holes totaling about 2,800 m and 23 rotary holes totaling an additional 4,300 m. The average mineralized intercept was about 18 m thick with grades near 0.35% copper. Seismic surveying also was performed during the year in an area around Flying Diamond to help define the ore-controlling structure (Gary Parkison, vice president, Exploration and Development, written commun., March 2007).

Milford Area

In 2006, Western Utah Copper Company (WUCC) focused its exploration efforts on definition drilling at the Candy B and Hidden Treasure deposits. Proven ore reserves in these deposits total about 2.2 Mt averaging 1.38% copper with a total resource estimated to be 36 Mt averaging a similar grade of copper. Upon further development of these deposits, WUCC planned an open pit mining operation, wherein the copper would be recovered by a column flotation, acid vat leaching, and electrowinning. During the year, WUCC continued its preparation of the plant site for construction of the operating facilities. WUCC controls more than 40,500 ha of land in the Milford area and has been actively exploring the Rocky Range and Beaver Lake mining districts for the past several years. These districts host seven partially defined copper skarn and breccia pipes containing byproduct gold and silver.

Commodity Review

Industrial Minerals

Industrial minerals production was the second-leading contributor to the value of Utah's minerals produced in 2006. The value of industrial minerals has grown substantially during the past 10 years. Commodities that realized the majority of the gains during this period included cement, construction sand and gravel, crushed stone, lime, magnesium chloride, phosphate rock, potash, and salt. These commodities accounted for 89% of the total value of Utah's industrial minerals segment in 2006. Other important mineral commodities produced during the year, in descending order of value, included gilsonite, expanded shale, common clay, bentonite and kaolinite, and gypsum. While the overall value of industrial minerals reached a record high, several commodities or commodity groups, including expanded shale and perlite, phosphate rock, and salt and other brine-derived products (magnesium chloride and potash) were lower in production value as a result of a decrease in production and/or declining commodity prices in 2006.

Cement.—Holcim, Inc. and Ash Grove Cement Company produced portland cement in the State during 2006. Holcim's Devils Slide Mine and plant are located east of Morgan in Morgan County, and Ash Grove's Leamington Mine and plant are east of Lynndyl in Juab County. Both plants operated at or above design capacity in 2006. In addition to limestone, Ash Grove mined a modest amount of shale and sandstone that was used in the manufacture of cement.

Common Clay and Bentonite.—Nearly 291,000 t of common clay and approximately 74,000 t of bentonite were produced by eight companies in 2006. Statewide, there were 19 active mine permits held by clay and/or bentonite operators in 2006. Many of these mines were operated intermittently. The two leading producers of common clay in 2006 were Interstate Brick and Interpace Industries Inc. Two companies (Western Clay Company and Redmond Minerals Inc.) produced bentonite from pits located in central Utah. In addition, Atlas Minerals began development of a high-alumina specialty clay (halloysite) mine in Juab County. More than 75% of all common clay is used in the manufacture of brick. Bentonite is used as a sealant in many civil engineering applications, as a pet-waste absorbent (litter-box filler), as an additive in oil and gas drilling fluids, and as a binder in foundry molds. High-alumina clays are used in the manufacture of cement and in numerous specialty applications including the field of nanotechnology.

Sand and Gravel, Construction, and Stone, Crushed.—Sand and gravel and crushed stone (including limestone and dolomite) were the third-leading contributors to the value of industrial minerals produced in Utah during 2006, with an estimated value of $219 million, about 12% higher than in 2005. These materials were produced in nearly every county in Utah by commercial operators as well as Federal, State, and county agencies. Because of the large number of operations (approximately 140 active pits and quarries), the UGS did not send production questionnaires to this group. However, production data for 2006, as compiled by the USGS, showed production of 38 Mt of sand and gravel with a value of $183 million, and 9.9 Mt of crushed stone with a value of $59.8 million. Sand and gravel production increased by 12% and crushed stone production increased by 15% in 2006 compared with that of 2005. Crushed stone production includes the raw material for both lime and cement plants.

Expanded Shale and Perlite.—Two companies, Harborlite Minerals Corp. (formerly Basin Perlite Company), a subsidiary of World Minerals Inc., Santa Barbara, CA, and Utelite, Inc. produced lightweight "expanded" products from shale and perlite for use primarily in the building and construction industries. World Minerals is owned by Imerys Performance Minerals, a French international company. Perlite production was about 390,000 cubic meters (m^3) in 2006, a slight increase from that of 2005. Utelite's shale mine and plant are east of the town of Wanship in Summit County. Harborlite Mineral's perlite mine is about 40 km north and east of the town of Milford in Beaver County, and the plant is located in Milford. The Harborlite Mine and plant were shut down in mid-2006 and remained inactive at yearend.

Gilsonite.—Gilsonite production in 2006 was estimated to be about 73,000 t, unchanged from that of 2005. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. Gilsonite is marketed worldwide for use in more than 150 products ranging from printing inks to explosives. All the gilsonite mines are located in southeastern Uintah County. The three companies that produced Gilsonite were, in descending order of production, American Gilsonite Company, Ziegler Chemical & Minerals Company, and Lexco, Inc.

Gypsum.—Five companies produced about 467,000 t of gypsum in 2006, about 75,000 t more than in 2005. In descending order of production, the three largest producers were

Georgia-Pacific Gypsum LLC, U.S. Gypsum Co., and Sunroc Corporation (a subsidiary of Clyde Companies Inc.) Georgia-Pacific and U.S. Gypsum operate the only two wallboard plants in Utah. Both plants are near the town of Sigurd in Sevier County. The Georgia-Pacific plant, which closed in 2002, reopened in 2006 and was operated on a full-time basis. Statewide, there were 14 permitted gypsum mines; 5 were listed as active and 9 were listed as inactive. Most gypsum produced in Utah was used for making wallboard, but several operators supplied raw gypsum to regional cement companies where it was used as an additive to control the setting time of cement, and to the agricultural industry where it was used as a soil conditioner.

Lime and Limestone.—Lime production was about 10% higher in 2006 than in 2005. Graymont Western U.S., Inc., produced dolomitic quick lime and high-calcium quick lime. Chemical Lime of Arizona, Inc. also produced dolomitic quick lime and hydrated dolomitic lime. The combined production capacity of these two companies was about 0.9 million metric tons per year (Mt/yr). Both operations served markets in Utah and surrounding States. Graymont Western's plant is in the Cricket Mountains, approximately 56 km southwest of Delta in Millard County, and is one of the 10 leading lime plants in the United States. Chemical Lime's plant is about 13 km northwest of Grantsville in Tooele County.

Statewide, DOGM lists 35 active limestone operations including 17 large mine and 18 small mine permits. Total limestone production reported was 3.20 Mt in 2006. Other uses of limestone include construction, and flue-gas desulphurization in coal-fired powerplants. A small amount of limestone is also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Phosphate Rock.—Simplot Phosphates LLC is Utah's only phosphate producer. The company's phosphate operation is 18 km north of Vernal in Uintah County. The mine produces in the range of 2.7 to 3.6 Mt/yr of ore, which is processed into 0.9 to 1.8 Mt of phosphate concentrate. The concentrate is transported in slurry form to the company's Rock Springs, WY, fertilizer plant via a 144-km underground pipeline.

Salt, Magnesium Chloride, and Potash.—Brine-derived products, including salt, were the second-leading contributors to the value of industrial-mineral production in Utah during 2006, having a combined value of $233 million, 11% less than in 2005. The decrease in value was attributed to the lower production of all of these mineral commodities. In addition to salt, brine-derived products include magnesium chloride and potash [potassium chloride and sulfate of potash (SOP)]. North Shore Limited Partnership produced a small quantity of concentrated brine that was used as an ingredient in mineral food supplements. The statewide production of salt and other brine-derived products, excluding magnesium metal, was estimated to be 3.42 Mt in 2006, about 0.96 Mt less than in 2005.

Three companies processing brine from Great Salt Lake provided most of the State's salt production. These three companies, in descending order of production, were Great Salt Lake Minerals Corporation, Cargill Salt Company, and Morton International. In addition, three other companies produce salt and/or potash from operations not located on Great Salt Lake. These included Intrepid Potash - Wendover LLC at Wendover in Tooele County (salt and potash), Intrepid Potash - Moab LLC near Moab in Grand County (salt and potash), and Redmond Minerals, Inc. near Redmond in Sanpete County (rock salt). Redmond Minerals has increased production significantly during the past 5 years.

Metals

Beryllium.—Utah continued to be the nation's sole producer of beryllium concentrates. Brush Resources Inc. operated a beryllium (bertrandite) mine and processing plant in Delta, Juab County, during the year. Bertrandite ore and imported beryl were processed at the company's plant several kilometers north of Delta in Millard County. The product, beryllium hydroxide, was then sent to the company-owned refinery and finishing plant in Ohio, where it was converted into beryllium metal, alloys, and oxide. Brush reported mining approximately 53,000 t of ore in 2006, in addition to purchasing about 45,000 t of beryl ore from the National Defense Stockpile. The company's Hogsback Mine was closed in 2006 and overburden removal at the new Fluro-Roadside pit was expected to begin in early 2007 (Brush Wellman Inc., 2007).

It was estimated that about 45% of beryllium use was in computer and telecommunications products. The remainder was used in aerospace and defense applications, appliances, automotive electronics, industrial components, and other applications (Shedd, 2007).

Copper.—Copper was the leading contributor to the value of nonfuel minerals in Utah. Substantial price increases from 2003 through 2006 raised the unit value of copper to an alltime high, and the value of base-metal production statewide to a record of nearly $2.9 billion. Refined copper production from KUC's Bingham Canyon Mine decreased in 2006 to approximately 218,000 t from approximately 232,000 t in 2005 (Rio Tinto, 2007).

Gold and Silver.—Refined gold production in 2006 was estimated to be about 14,000 kg [462,000 troy ounces (oz)], a 25% increase from the 11,500 kg (369,000 oz) produced in 2005 (Rio Tinto, 2007). Gold is produced from two surface mines owned by Kennecott Corporation: one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine) are both located in Salt Lake County. Several other small mines in the State produce minor amounts of gold and silver, but production is not reported here nor included in the above totals. The Barneys Canyon Mine exhausted its ore reserves in late 2001 and ceased mining, but was to continue production of gold from its heap-leach pads at a much reduced rate into 2007, when those pads were expected to be depleted. Silver byproduct recovered from the Bingham Canyon Mine netted 0.13 million kg (4.15 million oz) of refined silver in 2006, about 17% higher than in 2005 (Rio Tinto, 2007).

Magnesium.—Magnesium metal was the third-leading contributor to Utah's value of base metals in 2006. Magnesium metal was produced from Great Salt Lake brines by US Magnesium, LLC at its Rowley electrolytic plant in Tooele County. The plant's annual capacity was 43,000 t of magnesium metal (99.8% purity). It is the only primary magnesium processing facility in the United States. Magnesium production in 2006 was higher than that in 2005. Average magnesium metal prices declined from \$2.71 per kg in 2005 to \$2.53 per kg in 2006 (Kramer, 2007).

Molybdenum.—Molybdenum was the second-leading contributor to the value of Utah's base-metal production in 2006. KUC's Bingham Canyon Mine produced about 16,800 t of coproduct molybdenum in 2006, about 8% more than in 2005 (Rio Tinto, 2007). The increased production of molybdenum was largely offset by a 35% drop in molybdenum metal prices during the year. The Bingham Canyon mine was the second leading of nine molybdenum-producing mines in the United States in 2006. The USGS reported that the U.S. mine output of molybdenum in concentrate increased by 4% in 2006, compared with a 35% increase in 2005 (Magyar, 2007).

Mineral Fuels and Related Materials

Uranium.—The dramatic rise in the price of uranium during the past several years has had a substantial impact on exploration and development activity in Utah. Historically, Utah has been the third most important uranium-producing State. The majority of Utah's uranium property acquisition and work has focused on the Colorado Plateau (Gloyn and others, 2005).

In late 2006, Denison Mines Inc., Toronto, Ontario, Canada, acquired International Uranium Corp., Vancouver, British Columbia, Canada, and all of its assets in Utah including the White Mesa uranium mill, the Pandora Mine, and the Henry Mountains Complex. The resulting company, Denison Mines Corp., then began a \$15 million upgrade to the mill, which was expected to produce more than 1,330 t of triuranium octaoxide (U_3O_8) and 2,000 t of vanadium pentoxide (V_2O_5) by 2010.

Denison also resumed mining at the Pandora Mine in the eastern La Sal District, becoming the first productive uranium mine in the State since the early 1990s. Production in 2006 totaled about 1,100 t of ore. The ore from the Pandora Mine was to be shipped about 110 km south to the White Mesa mill near Blanding and stockpiled until mill conversion work was completed in early 2008 (Jon Showalter, Denison Mines, personal commun., March 2007).

Denison Mines' Henry Mountains Complex (Tony M Mine and Bullfrog property) in the Shootaring Canyon district is thought to host the largest known uranium resource in Utah, estimated to be about 4.9 Mt averaging 0.22% U_3O_8. Mining permits from DOGM for this operation were pending at yearend. Mining at the Henry Mountains Complex was scheduled to resume in 2007.

Mesa Uranium Corp. and Universal Uranium Ltd., each based in Vancouver, British Columbia, Canada, continued drill programs at their interlocking properties in the Lisbon Valley mining district. Mesa completed the drilling of 10 holes with a total depth of 8,100 m, intersecting strongly anomalous uranium mineralization in two holes. Mesa also drilled three additional holes on their adjoining North Alice property, intersecting anomalous uranium and copper mineralization in two of these holes (Mesa Uranium Corp., 2006, 2007). Universal drilled 12 holes totaling 9,400 m in 2006, intersecting anomalous uranium mineralization in six of the holes. In a second exploration phase, Universal drilled eight holes totaling 6,200 m with another 10 holes planned for 2007 (Universal Uranium Ltd., 2006).

Several companies acquired property containing known uranium resources during the year. Energy Metals Corp., Vancouver, British Columbia, Canada, acquired the Velvet property, with 210,000 t of ore averaging 0.43% U_3O_8 in the Lisbon Valley district; the Frank M property with 1.36 Mt of ore averaging 0.12% U_3O_8 in the Shootaring Canyon district; and the San Rafael property with 587,000 t of ore averaging 0.16% U_3O_8 in the Green River area. The San Rafael property is a joint venture with Vancouver-based Magnum Uranium Corp., which also controls three other uranium properties in Utah.

Vancouver-based SXR Uranium One, Inc. acquired the uranium assets of U.S. Energy Corp., Riverton, WY, including the Shootaring Canyon uranium mill in the Henry Mountains area and several Utah uranium prospects. The mill was being repermitted for operation. U.S. Energys' Utah properties include the Sahara Mine with 99,000 t of ore averaging 0.23% U_3O_8 in the San Rafael River uranium district (SXR Uranium One, Inc., 2007).

Trigon Uranium Corp., Golden, CO, acquired a volcanic-hosted uranium property in the Central Mining Area near Marysvale. Historical drilling data indicate a resource estimated to be about 680,000 t averaging 0.075% U_3O_8 (Trigon Uranium Corp., 2006).

Government Programs and Activities

Federal Government

Environmental Issues.—The U.S. Department of Energy and the State of Utah agreed in 2005 to move the 10.5 Mt of uranium mill tailings located along the Colorado River near Moab. The tailings, estimated to average about 100 ppm uranium and 400 ppm vanadium, will be moved 48 km north to a site near Crescent Junction, Utah. Cleanup operations and revegetation peripheral to the Moab tailings location were completed in 2006. Construction of the disposal cell at Crescent Junction was not expected to begin before 2009.

Reclamation at the Midvale slag Superfund site along the Jordan River was completed during the year, allowing for mixed-use development of the site to begin. The development, to be named Bingham Junction, was expected to include 48 ha of houses, apartments, retail, and office space with an associated 4.5 ha of wetland.

State Government

Environmental Issues.—DOGM continued its program of closing abandoned mines. The program has already closed an estimated 6,000 to 7,000 mine openings. Four new mine closing projects involving another 1,000 openings are planned for 2007. The projects include the Gold Hill District, the Mammoth section of the Tintic District, the San Rafael Swell, and the Star District.

A consortium of Snowbird Ski Resort, Tiffany & Co., Trout Unlimited, and the U.S. Environmental Protection Agency, teamed up to reclaim the abandoned Pacific Mine in the American Fork District. The cleanup, which had been delayed under certain regulations in the 1971 Clean Water Act, was completed under a special Good Samaritan variance from the Act.

Shaw Environmental, Inc. mined approximately 202,000 m^3 of limestone from its Lime Peak quarry in the Tintic District. This stone was then planned to be used for rip rap in the remediation of historical mine dumps near the town of Eureka.

Utah Geological Survey Publications.—The following publications provide new information on the mineral resources of Utah. These publications and others are listed on the UGS Web site at http://geology.utah.gov/ and are available for purchase at the DNR Map and Bookstore. Additional free geographic information system (GIS) data on Utah are available for download at http://agrc.its.state.ut.us/.

Mining Districts of Utah, edited by Roger Bon, Robert Gloyn, and Gerald Park, was released on compact disk (CD) as Utah Geological Association (UGA) Publication 32. The CD contains more than a dozen papers on the history, production, and geology of individual Utah mining districts, including most of the largest districts: Bingham, Lisbon Valley, Park City, Spor Mountain, Stockton, and Tintic. Also included are ancillary papers on the history of metal prices and mining in Utah.

A collection of reprints, Uranium/Vanadium Publications of the UGS, was released as UGS Open-File Report 462. This CD contains 14 publications totaling 1,418 pages and 14 plates. Included in this collection is the most complete publication (Uranium-Vanadium Occurrences of Utah) on uranium in Utah.

Another collection of reprints, Selected Lead and Zinc Publications of Utah, compiled by Ken Krahulec was released as UGS Open-File Report 466. The CD contains 10 papers totaling 759 pages, including a 1976 report on lead and zinc in Utah that is the most comprehensive work to date on the subject.

Geology of Northwestern Utah, UGA Publication 34, is a CD edited by Kimm Harty and David Tabet. The CD contains five papers on mineral resources, including articles on the Dugway mining district; Vipont Mine in the Ashbrook District; travertine at Aragonite; Mountain City District; and limestone, dolomite, and silica occurrences of northwestern Utah.

Other recent publications from the UGS on minerals and energy resources include (1) Coal Resource Map of Utah (Map 226DM), (2) The Available Coal Resource for Eight 7.5-minute Quadrangles in the Alton Coalfield, Kane County, Utah (Special Studies 118), (3) Utah Oil Shale Database (Open-File Report 469), and (4) History and Mineral Resource Characterization of Sevier Lake, Millard County, Utah (Miscellaneous Publication 06–6). In addition, gilsonite resources and mining in the Uinta Basin were reported (Tripp and White, 2006).

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TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN UTAH[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004 Quantity	2004 Value	2005 Quantity	2005 Value	2006 Quantity	2006 Value
Beryllium concentrates metric tons	2,210	NA	2,780	NA	3,830	NA
Clays:						
Bentonite	73	W	W	W	W	W
Common	443	5,600	478	6,710	526	10,700
Gemstones, natural	NA	235	NA	235	NA	238
Salt	2,250	107,000	2,250	132,000	2,810	149,000
Sand and gravel, construction	29,800	125,000	33,900	149,000	38,000	183,000
Stone, crushed	8,030	45,100	8,570 [r]	52,100 [r]	9,860	59,800
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade–A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by the symbol W	XX	1,660,000	XX	2,460,000	XX	3,560,000
Total	XX	1,950,000	XX	2,800,000 [r]	XX	3,960,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2

UTAH: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone	12 [r]	3,620 [r]	$19,900 [r]	12	4,700	$28,000
Dolomite	3	2,890	15,800	2	3,630	21,900
Traprock	--	--	--	1	1	8
Sandstone and quartzite	6	1,350	11,900 [r]	10	780	5,270
Volcanic cinder and scoria	2	28	189	2	17	313
Miscellaneous stone	7 [r]	691 [r]	4,320 [r]	4	730	4,230
Total	XX	8,570 [r]	52,100 [r]	XX	9,860	59,800

[r] Revised. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Other coarse aggregate	W	W
Fine aggregate (-⅜ inch):		
Screening, undesignated	W	W
Othe fine aggregate	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	W	W
Other construction materials	34	596
Agricultural:		
Limestone	W	W
Other agricultural uses	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Flux stone	W	W
Sulfur oxide removal	W	W
Other miscellaneous uses and specified uses not listed	9	24
Unspecified:[2]		
Reported	4,070	25,100
Estimated	1,700	9,800
Total	5,730	34,900
Grand total	9,860	59,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4

UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	--	--	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--	--	--
Other construction materials	33	591	1	5	--	--	--	--
Agricultural[6]	W	W	--	--	--	--	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--	--	--
Other miscellaneous uses	--	--	9	24	--	--	--	--
Unspecified:[8]								
Reported	81	1,060	3,550	21,600	20	121	416	2,320
Estimated	770	4,400	630	3,800	260	1,600	--	--
Total	3,780	23,600	5,380	32,100	283	1,720	416	2,320

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] No production for District 4.

[3] Includes riprap and jetty stone and other coarse aggregate.

[4] Includes screening (undesignated) and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6] Includes agricultural limestone and other agricultural uses.

[7] Includes cement and lime manufacture, flux stone, and sulfur oxide removal.

[8] Reported and estimated production without a breakdown by end use.

TABLE 5
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,180	$12,400	$5.71
Plaster and gunite sands	54	388	7.19
Asphaltic concrete aggregates and other bituminous mixtures	1,020	7,210	7.06
Road base and coverings[2]	6,630	34,200	5.16
Fill	4,740	16,700	3.52
Snow and ice control	36	141	3.92
Railroad ballast	20	76	3.80
Other miscellaneous uses	60	300	5.00
Unspecified:[3]			
Reported	10,000	49,000	4.89
Estimated	13,200	62,800	4.75
Total or average	38,000	183,000	4.82

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (cement).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	W	W	337	2,800
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	318	1,750
Road base and coverings[3]	1,930	10,400	2,280	12,400	1,860	9,250
Fill	560	1,420	3,240	13,100	100	202
Snow and ice control	26	101	1	3	9	37
Railroad ballast			17	52	3	25
Other miscellaneous uses	701	5,240	1,710	9,210	--	--
Unspecified:[4]						
Reported	2,840	14,400	6,380	32,100	392	1,720
Estimated	3,270	15,700	7,850	37,200	2,110	9,980
Total	9,320	47,200	21,500	104,000	5,130	25,800

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	253	1,340
Road base and coverings[3]	557	2,100
Fill	839	2,000
Snow and ice control	--	--
Railroad ballast	--	--
Other miscellaneous uses	--	--
Unspecified:[4]		
Reported	426	822
Estimated	--	--
Total	2,080	6,260

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

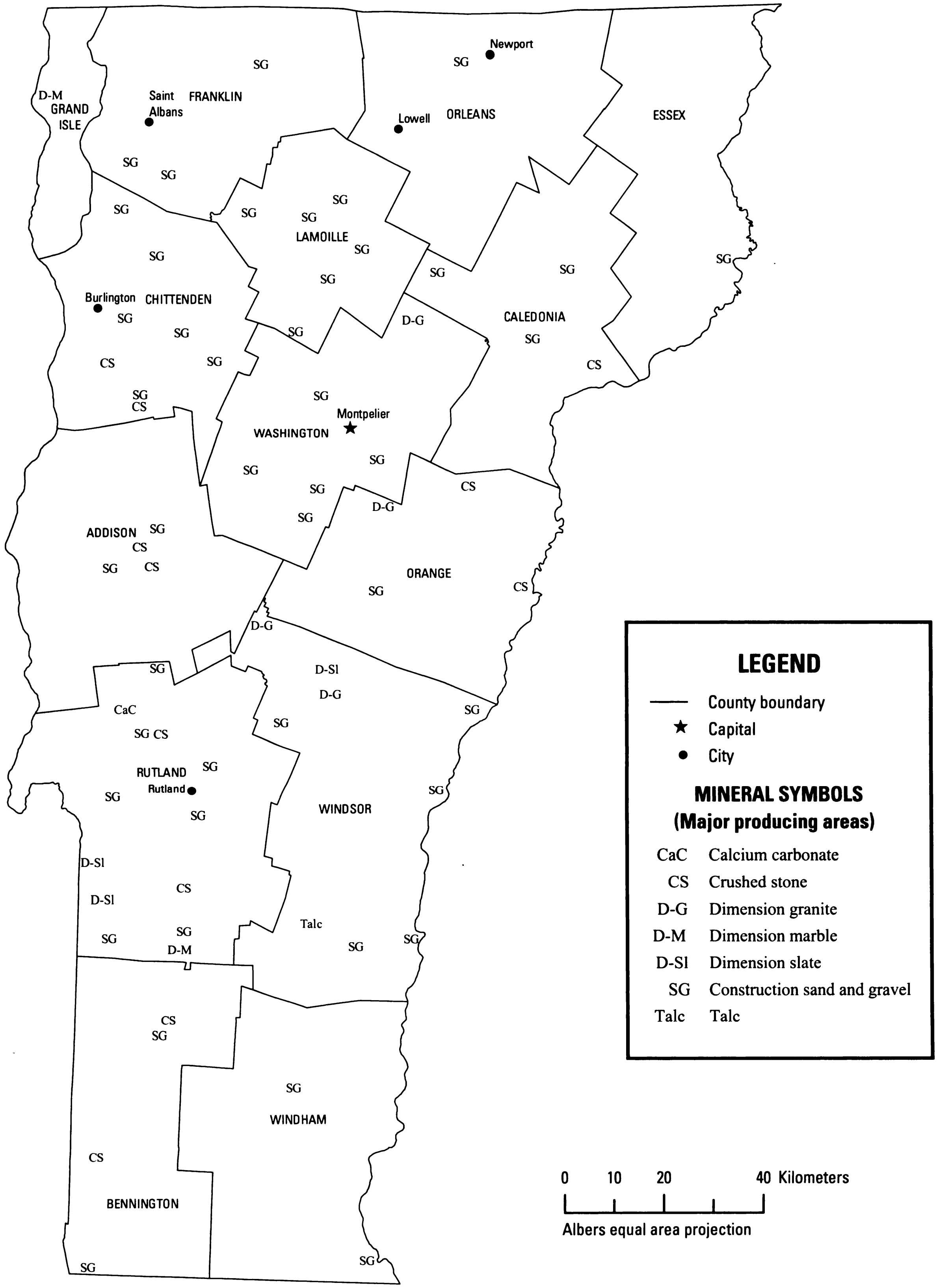
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Reported and estimated production without a breakdown by end use.

VERMONT



Source: Vermont Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF VERMONT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Vermont Geological Survey for collecting information on all nonfuel minerals.

In 2006, Vermont's nonfuel raw mineral production[1] was valued at $84.2 million,[2] based upon annual U.S. Geological Survey (USGS) data. Although this represents a 13.8% decrease from the State's total nonfuel mineral value for 2005, Vermont's total nonfuel mineral value actually significantly increased from that of 2005; a significant portion of crushed stone data (in addition to talc data) were withheld because they were company proprietary data. Vermont was 47th in rank (45th in 2005) among the 50 States in total nonfuel mineral production value, yet, per capita, the State ranked 28th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 624,000, the value of production was about $135 per capita.

In 2006, crushed stone, construction sand and gravel, and dimension stone, in descending order of value,[2] were Vermont's leading nonfuel mineral commodities. A significant increase took place in the actual production and value of crushed stone. Similarly, an 11% increase in construction sand and gravel production resulted in a $5.3 million increase in value from that of 2005 (table 1). The production of talc had only a small increase, but because of a more substantial increase in unit value, its value of production rose by more than 20%.

In 2005, Vermont continued to be ranked third in the quantity of talc produced among seven producing States and rose to third from fourth in the production of dimension stone.

The Vermont Geological Survey[3] (VGS) provided the following narrative information. The State Geologist manages interdisciplinary studies with strong geologic components, especially those focused on surface waters, ground water resources, and geologic hazards. Review of projects as they relate to Criteria 9D and 9E of Act 250, known as the Land Use and Development Act, is a VGS activity that recognizes the importance of lands with high potential for extraction of mineral and earth resources. The VGS reviews and makes recommendations regarding mine and quarry reclamation plans in response to current environmental concerns. Work continued on a Statewide study of ground water analysis, and the State provided geologic support and published various open file reports. These are made available to the public, consultants, industry, and government.

Advice to the public is provided on a variety of matters as required by State statute. Guidance is provided when questions arise about the development of rock and mineral deposits suitable for building, road making, and economic purposes. In the event of any significant discovery of hydrocarbons in the State, the VGS provides geologic services for Vermont's Natural Gas and Oil Resources Board. Information about the VGS and the Earth Resources pages is available at http://www.anr.state.vt.us/dec/geo/vgs.htm.

Environmental Issues

The following narrative was taken from the Vermont Agency of Natural Resources, Department of Environmental Conservation, Waste Management Division:

"The Vermont Asbestos Group Mine (VAG) site is an inactive asbestos mine and mill which operated in the early 1900s and closed in 1993. It was the largest asbestos mine in the United States. The mine site comprises 623 hectares on private lands on Belvidere Mountain within the towns of Eden and Lowell, Vermont. The mine site consists of a network of eleven mine and mill buildings and structures and two significant mill tailings piles estimated at 26-27 million metric tons. The asbestos ore was mined from open pits producing chrysotile "white" asbestos. 90 to 96% of the chrysotile mined in the United States came from the VAG Mine. General Aniline & Film Corporation (GAF), along with its predecessor corporation Ruberoid, operated the mine from 1936–1975. In 1975, the current owner, VAG purchased the property from GAF. In the late 80s and early 90s, the production rate at the mine was significantly less than in the past. The mine closed in 1993" (Vermont Agency of Natural Resources, undated).

In late 2004, the Vermont Agency of Natural Resources, Department of Environmental Conservation, Wetlands Program received a complaint from a down-gradient property owner about tailings material eroding onto his wetland. The Vermont Agency of Natural Resources, Department of Environmental Conservation, Wetlands Program began a 2-year study in 2005 of the biological and chemical assessments within the Lamoille River and Missisquoi River watersheds. Data indicated that the aquatic biota, water quality, and streambed quality were degraded in both watersheds. In May 2006, the State met with officials from the U.S. Environmental Protection Agency and the Agency of Toxic Substance and Disease Registry to discuss site assessment and funding options for remediation of the site. In August 2006, VAG hired a consultant from URS Corporation to address interim corrective action measures and to collect data for a human health assessment.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Because data for crushed slate (2005-06), crushed marble and crushed quartzite (2006), and talc have been withheld (company proprietary data), the actual total values for 2004-06 are substantially higher than those reported in table 1.

[3] Marjorie Gale, Environmental Scientist V, a Geologist with the Vermont Geological Survey, authored the text of the State mineral industry information provided by that agency. The Vermont Geological Survey is designated in Vermont State government as the Division of Geology and Mineral Resources within the Vermont Department of Environmental Conservation.

Government Programs

In 2006, Vermont issued 10 sand and gravel extraction permits and amendments through the Act 250 process, Vermont's Land Use and Development Law. Extraction rates varied up to a maximum of 38,000 cubic meters per year. There were three permits issued for surface extraction of up to 1,150 cubic meters of stones to be used for landscaping. There were seven permit applications submitted for sand and gravel extraction for Act 250 review in 2006 and the process will continue into 2007. Two sand and gravel pit applications and two rock quarry applications were denied.

The District Environmental Court ruled in favor of the appeal from J.P. Carrara & Sons, Inc. and concluded that "Carrara's proposed continuation, deepening and continued use of explosives in its Quarry will not cause or result in a detriment to the public health, safety, or general welfare under the applicable criteria preserved in this appeal, provided its operation conforms with Carrara's application and all exhibits submitted, and provided its operation conforms to the terms and conditions referenced in the permit that accompanies this Decision." (Durkin, 2006). The Carrara Dolomite Quarry on Route103 in Clarendon first obtained an Act 250 permit in 1988. In 1996, Carrara began extracting rock from below ground level. In 2005, Carrara filed for an amendment to expand and lower the quarry floor to a depth of 158 meters above sea level. Neighbors' opposition to the expansion was mainly based on a variety of water issues. OMYA Inc., North America with a plant in Florence, Vermont, hosted the sixth annual open house at its white marble quarry in Middlebury during Earth Science Week 2006. Visitors were able to view and experience first hand the rocks, quarry equipment, and products. The calcium carbonate in ground form produced by OMYA is used in food, paint, paper, pharmaceuticals, and plastics.

The VGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program for universities that has a goal to train the next generation of geologic mappers.

The VGS continued geologic operations conducting surveys and research of the geology, mineral resources, and topography of the State. Emphasis was on completion of the bedrock map of Vermont, surficial mapping by quadrangle and watershed, and a natural hazard map program. The VGS published several maps including bedrock geologic maps of Middlesex, Stowe, Williston, and Woodstock. Surficial geologic maps were published for Middlesex, Wallingford, and Stowe. A surficial and ground water resources map was published for Woodstock. All maps are in 1:24,000 scale. Mapping projects address societal issues in Vermont: landslide hazard, nitrate and naturally occurring radionuclides in bedrock and ground water, and riverine erosion. Prototype aquifer and aquifer recharge area mapping is underway for town planning. Digital surficial and bedrock data were also used to customize HAZUS, a multihazard risk assessment computer program, to make it realistically simulate local Vermont conditions.

References Cited

Durkin, T.S., 2006, Route 103 Quarry (Appeal of J.P. Carrara & Sons, Inc.)—Decision on the merits: Vermont Environmental Court (Docket No. 205–10–05 Vtec). (Accessed June 19, 2009, at http://www.vermontjudiciary.org/GTC/Environmental/ENVCRT Opinions/Route 103 Quarry 205-10-05 Vtec.pdf.)

Vermont Agency of Natural Resources, [undated], Vermont asbestos group mine site: Vermont Agency of Natural Resources. (Accessed June 19, 2009, at http://www.anr.state.vt.us/DEC/wastediv/sms/VAG/Site.Chronology.pdf.)

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN VERMONT[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel, construction	4,970	24,000	5,240	32,000	5,810	37,300
Stone:						
Crushed	5,110	30,800	4,960 [r, 3]	37,900 [r, 3]	2,070 [3]	19,300 [3]
Dimension	100	30,600	98	27,800	100	27,600
Talc, crude	W	W	W	W	W	W
Total	XX	85,400	XX	97,700 [r]	XX	84,200

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; value withheld to avoid disclosing company proprietary data.

TABLE 2
VERMONT: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2006 Number of quarries	2006 Quantity (thousand metric tons)	2006 Value (thousands)
Limestone[2]	6	1,380	$9,010	7	1,550	$14,500
Dolomite	2 [r]	216 [r]	1,460 [r]	2	205	1,610
Granite	2	303	2,130	2	278	2,820
Marble	1	2,030	13,700	1	W	W
Quartzite	2	987 [r]	11,200 [r]	2	W	W
Slate	1	W	W	1	W	W
Miscellaneous stone	1	49	365	1	43	423
Total	XX	4,960 [r]	37,900 [r]	XX	2,070	19,300

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
VERMONT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregate	31	169
Total	40	2,630
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Other graded coarse aggregate	32	199
Fine aggregate (-⅜ inch), other	4	17
Coarse and fine aggregates:		
Graded road base or subbase	(2)	(2)
Other coarse and fine aggregates	243	1,560
Unspecified:[3]		
Reported	831	8,250
Estimated	910	8,800
Total	1,740	17,100
Grand total	2,070	19,300

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3] Reported and estimated production without a breakdown by end use.

TABLE 4

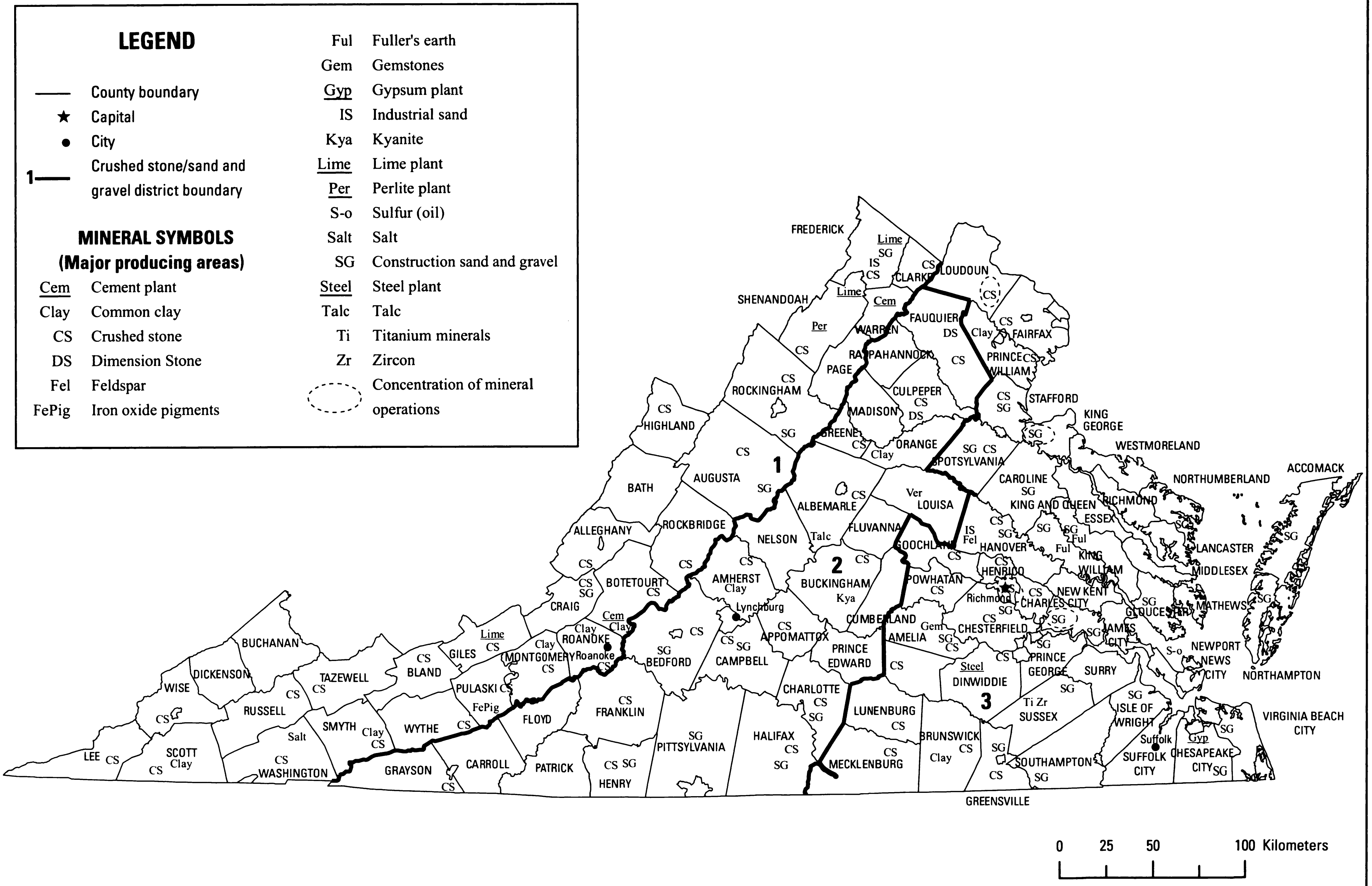
VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	399	$3,920	$9.83
Asphaltic concrete aggregates and road base materials	866	5,670	6.54
Fill	229	509	2.22
Snow and ice control	186	935	5.03
Filtration	32	238	7.44
Other miscellaneous uses	147	307	2.09
Unspecified:[2]			
Reported	764	5,580	7.30
Estimated	3,190	20,200	6.33
Total or average	5,810	37,300	6.42

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

VIRGINIA



Source: Virginia Department of Mines, Minerals, and Energy/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Virginia Department of Mines, Minerals and Energy for collecting information on all nonfuel minerals.

In 2006, Virginia's nonfuel raw mineral production[1] was valued at $1.27 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $120 million, or nearly 10.5%, from the State's total of $1.15 billion in 2005, which was up by $259 million, or slightly more than 29% from 2004 to 2005. Virginia remained 18th in rank among the 50 States in total nonfuel raw mineral production value and accounted for nearly 2% of the U.S. total.

Crushed stone was, by value, Virginia's leading raw nonfuel mineral, accounting for about 64% of the State's total nonfuel mineral value in 2006. From 1990 through 2006, the State produced nearly 1.06 billion metric tons of crushed stone, or an average of 62.3 million metric tons per year (Mt/yr) during that 17-year period. Virginia's quarries during the past 6 years, on average, have produced more than 71.5 Mt/yr of crushed stone. Cement (masonry and portland) was the second leading nonfuel mineral commodity produced, followed by construction sand and gravel, lime, and zirconium concentrates. These five mineral commodities represented slightly more than 91% of the State's total nonfuel mineral value.

Nearly all of the State's nonfuel mineral commodities increased in value in 2006, led by the increases in the values of crushed stone, construction sand and gravel, crushed marble, titanium mineral concentrates (ilmenite), and lime. Although production did increase for a majority of the mineral commodities, much of the increase in 2005 and 2006 resulted from higher average unit prices for most of the mineral commodities.

The production value of crushed stone rose by $42 million, despite a 13% decrease in production tonnage. Construction sand and gravel had a 28% value increase of about $24 million followed by crushed marble (data withheld—company proprietary data); ilmenite with a 75% increase in value, in part the result of a modest increase in production; and lime with a more than $12 million rise in value with a small increase having taken place in its production. Other mineral commodities having increases in value were cement and zirconium concentrates, up in the vicinity of $7 million each, and common clays and fuller's earth, with about $3 million each (table 1).

In 2006, Virginia continued to be the only State to mine and produce kyanite. It also continued to rank second in the production of zirconium of the two zirconium-producing States, second in feldspar, second in crude vermiculite of the two producing States, and eighth in the production of crushed stone. The State rose in rank to first in ilmenite of the two ilmenite-producing States, to third from fourth in iron oxide pigments, and to fourth from fifth in fuller's earth clays (within same rankings, commodities are listed in descending order of value). Additionally, significant quantities of portland cement, construction sand and gravel, masonry cement, common clays, and gemstones (in descending order of value) were produced in the State. Although the only producing kyanite mine and calcined kyanite (mullite) facilities in the United States were in Virginia, synthetic mullite, which in USGS terminology is a calcined bauxitic kaolin, was produced in one other State. About 90% of the U.S. kyanite and mullite output was used in refractories, mostly for the smelting and processing of a variety of metals (60% to 65% in ironmaking and steelmaking), as well as in the manufacture of chemicals, glass and high-temperature ceramics, and other materials.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	5	W	--	--	--	--
Common	994	4,640	983	4,690	762	1,810
Kyanite	90	13,400	90	13,400	90	14,000
Sand and gravel, construction	12,800	75,800	12,000	85,800	14,200	110,000
Stone:						
Crushed	73,700 [3]	540,000 [3]	85,700 [r]	772,000 [r]	74,800 [3]	814,000 [3]
Dimension	5	594	6	631	6	631
Talc, crude	--	--	1	15	W	W
Combined values of cement, clays (fuller's earth), feldspar, gemstones (natural), iron oxide pigments (crude), lime, sand and gravel (industrial), stone [crushed marble (2004, 2006)], titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates, and values indicated by symbol W	XX	256,000	XX	272,000	XX	333,000
Total	XX	891,000	XX	1,150,000 [r]	XX	1,270,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	43 [r]	28,400 [r]	$253,000 [r]	41	21,800	$239,000
Dolomite	7	3,400	27,900	6	2,870	21,000
Marble	--	--	--	1	W	W
Granite	27 [r]	30,900 [r]	290,000 [r]	29	29,300	329,000
Sandstone and quartzite	5	2,180	19,900	5	1,860	17,200
Traprock	10	18,600	164,000	10	18,300	201,000
Slate	1	136	1,240	1	133	1,420
Miscellaneous stone	4 [r]	2,070 [r]	15,800 [r]	4	625	5,000
Total	XX	85,700 [r]	772,000 [r]	XX	74,800	814,000

[r] Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	286	2,850
Filter stone	280	2,730
Other coarse aggregate	2,090	25,900
Total	2,650	31,500
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,650	15,900
Bituminous aggregate, coarse	1,590	9,740
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	453	4,460
Other graded coarse aggregate	10,800	124,000
Total	14,500	154,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	776	4,690
Stone sand, bituminous mix or seal	223	1,500
Screening, undesignated	563	4,200
Other fine aggregate	3,870	34,600
Total	5,430	45,000
Coarse and fine aggregates:		
Graded road base or subbase	2,880	25,100
Unpaved road surfacing	1,000	7,690
Crusher run or fill or waste	1,660	9,360
Roofing granules	(3)	(3)
Other coarse and fine aggregates	9,460	99,500
Total	15,000	142,000
Other construction materials	118	483
Agricultural:		
Limestone	417	3,960
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	36	296
Total	453	4,260
Chemical and metallurgical:		
Lime manufacture	(5)	(5)
Chemical stone	(5)	(5)
Special:		
Mine dusting or acid water treatment	(5)	(5)
Other fillers or extenders	(5)	(5)
Other miscellaneous uses:		
Waste material	(5)	(5)
Other specified uses not listed	(5)	(5)
Unspecified:[6]		
Reported	28,800	322,000
Estimated	7,000	73,000
Total	35,900	395,000
Grand total	74,800	814,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[3] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4] Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[5] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6] Reported and estimated production without a breakdown by end use.

TABLE 4
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,070	29,400	1,790	10,900	9,390	114,000
Fine aggregate (-⅜ inch)[4]	2,960	25,000	563	3,140	1,920	16,900
Coarse and fine aggregate[5]	5,460	43,900	1,630	12,200	7,920	85,600
Other construction materials	118	483	--	--	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Special[8]	W	W	--	--	--	--
Other miscellaneous uses[9]	W	W	W	W	--	--
Unspecified:[10]						
Reported	2,420	26,900	5,540	62,300	20,900	233,000
Estimated	6,500	67,000	340	3,700	150	1,600
Total	22,700	246,000	10,300	97,500	41,700	470,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes limestone, poultry grit and mineral food, and other agricultural uses.

[7] Includes chemical stone and lime manufacture.

[8] Includes mine dusting or acid water treatment and other fillers or extenders.

[9] Includes waste material and other specified uses not listed.

[10] Reported and estimated production without a breakdown by end use.

TABLE 5
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,380	$50,900	$9.47
Plaster and gunite sands	91	981	10.78
Concrete products (blocks, bricks, pipe, decorative, etc.)	214	2,370	11.07
Asphaltic concrete aggregates and road base materials	1,020	6,300	6.17
Fill	1,400	5,640	4.02
Snow and ice control	10	61	6.10
Golf course	35	405	11.57
Other miscellaneous uses	32	324	10.12
Unspecified:[2]			
Reported	2,590	17,100	6.62
Estimated	3,380	26,100	7.72
Total or average	14,200	110,000	7.79

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6

VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	535	6,220	--	--	5,150	48,000
Asphaltic concrete aggregates and road base materials	W	W	W	W	853	5,160
Fill	15	25	--	--	1,390	5,610
Other miscellaneous uses[3]	130	998	71	478	6	50
Unspecified:[4]						
Reported	23	204	--	--	2,570	16,900
Estimated	816	6,300	1,590	12,300	972	7,500
Total	1,520	13,700	1,660	12,800	10,900	83,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

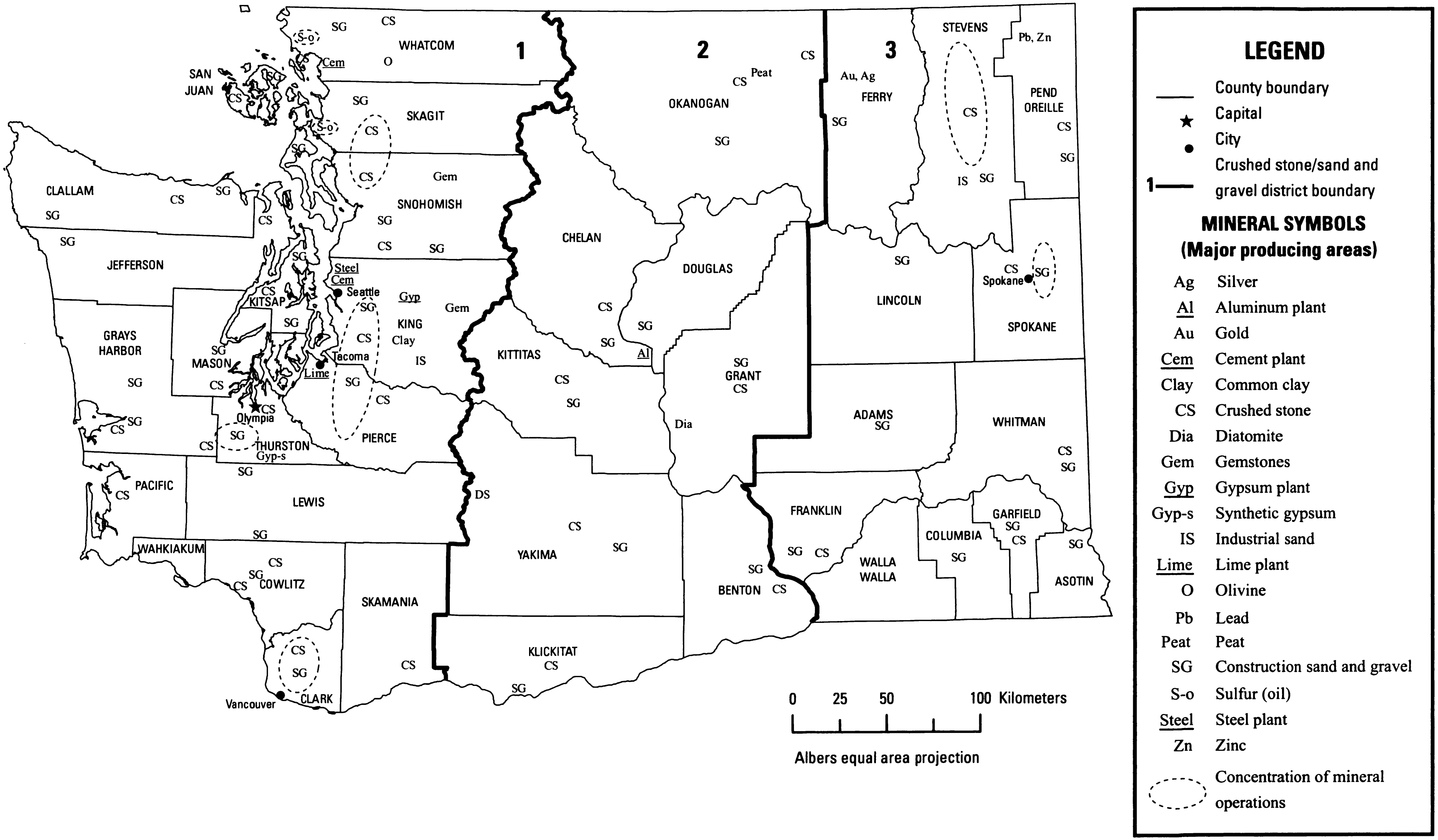
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes golf course and snow and ice control.

[4] Reported and estimated production without a breakdown by end use.

WASHINGTON



Source: Washington State Division of Geology and Earth Resources/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF WASHINGTON

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Washington Department of Natural Resources, Division of Geology and Earth Resources, for collecting information on all nonfuel minerals.

In 2006, Washington's nonfuel raw mineral production[1] was valued at $718 million, based upon annual U.S. Geological Survey (USGS) data. This was a 12.5% increase of $80 million from that of 2005, which was up nearly 26%, or up by $131 million, from that of 2004. For the third consecutive year, the State was 30th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total value.

In 2006, based upon value, Washington's leading nonfuel mineral commodities were, in descending order of value, construction sand and gravel, crushed stone, zinc, portland cement, and lime; the two aggregate commodities accounted for nearly 62% of the State's total nonfuel mineral value. Substantial increases took place in the values of the first three, offset somewhat by significant decreases in the values of gold and portland cement, and less so by decreases in the values of lead and olivine. Although a significant decrease took place in the quantity of zinc that was produced, the mineral commodity's value of production rose by more than $50 million because of the metal's higher average annual prices. A relatively small increase in construction sand and gravel production led to a $33 million, or nearly 12%, increase in its value, while a more than 12% decrease in crushed stone production, nevertheless resulted in a $26 million rise in its value (table 1). Smaller yet significant increases also took place in the production and values of lime and industrial sand and gravel. Gold production ceased in the State following the late 2005 closing of the State's lone producing gold mine, the Kettle River Mine in Ferry County, because, as was announced by the owner, Kinross Gold (Toronto, Ontario, Canada), the mine was out of ore (Platts Metals Week, 2005).

In 2006, Washington was the only State that produced olivine, and continued to be fourth of four diatomite-producing States, and fourth among five States in the quantities of lead produced. The State rose to sixth from eighth in construction sand and gravel production and was sixth in the production of fire clay (the first production in the State reported to the USGS since 1994), but decreased to third from second in the production of zinc. Additionally, significant quantities of crushed stone and portland cement continued to be produced in the State. Primary aluminum and raw steel also were produced in Washington, but both metals were processed from materials acquired from foreign and other domestic sources. In 2006, the State continued to be eighth in rank of 11 primary aluminum-producing States.

Reference Cited

Platts Metals Week, 2005, Kinross to start laying off miners: Platts Metals Week, v. 76, no. 48, November 28, p. 4.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	W	W	W	W	53	149
Fire	--	--	--	--	25	41
Gemstones, natural	NA	44	NA	44	NA	49
Sand and gravel, construction	41,500	227,000	47,200	282,000	48,400	315,000
Stone, crushed	12,100	75,500	14,300 [r]	101,000 [r]	12,500	127,000
Combined values of cadmium (byproduct in zinc concentrates),[3] cement (portland), diatomite, gold (2004–05), lead, lime, olivine, peat, sand and gravel (industrial), silver (2004–05), stone (dimension miscellaneaous), zinc, and values indicated by the symbol W	XX	205,000	XX	255,000	XX	277,000
Total	XX	507,000	XX	638,000 [r]	XX	718,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Data not available for 2006.

TABLE 2
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	17 [r]	2,250 [r]	$14,000 [r]	17	2,190	$37,000
Dolomite	29	191 [r]	944 [r]	20	152	778
Marble	3 [r]	387 [r]	3,940 [r]	3	300	3,550
Granite	6 [r]	683 [r]	4,990 [r]	8	1,300	12,900
Sandstone	3	W	W	3	(3)	(3)
Traprock	53 [r]	5,910 [r]	39,000 [r]	60	6,350	54,000
Volcanic cinder and scoria	1	42	298	1	56	581
Slate	1	W	W	--	--	--
Miscellaneous stone	14 [r]	4,410 [r]	30,900 [r]	20	2,160	17,600
Total	XX	14,300 [r]	101,000 [r]	XX	12,500	127,000

[r] Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

[3] Withheld to avoid disclosing company proprietary data.

TABLE 3

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	241	3,520
Filter stone	W	W
Other coarse aggregate	589	4,910
Total	830	8,430
Coarse aggregate, graded:		
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	340	2,260
Total	607	4,350
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(3)	(3)
Screening, undesignated	(3)	(3)
Other fine aggregate	1	4
Coarse and fine aggregate:		
Graded road base or subbase	706	4,540
Unpaved road surfacing	487	2,950
Crusher run or fill or waste	(2)	(2)
Roofing granules	(2)	(2)
Other coarse and fine aggregates	704	5,800
Total	2,380	18,200
Other construction materials	35	307
Agricultural:		
Limestone	(3)	(3)
Poultry grit and mineral food	(3)	(3)
Chemical and metallurgical, lime manufacture	(3)	(3)
Special:		
Mine dusting or acid water treatment	(3)	(3)
Asphalt fillers or extenders	(3)	(3)
Other fillers or extenders	(3)	(3)
Other miscellaneous uses and specified uses not listed	105	1,380
Unspecified:[4]		
Reported	2,080	14,000
Estimated	6,000	54,000
Total	8,050	68,300
Grand total	12,500	127,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4] Reported and estimated production without a breakdown by end use.

TABLE 4
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	--	--	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--	--	--
Coarse and fine aggregate[5]	W	W	316	2,040	W	W	--	--
Other construction materials	35	307	--	--	--	--	--	--
Agricultural[6]	--	--	W	W	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	W	W	--	--	W	W	--	--
Other miscellaneous uses	105	1,380	--	--	--	--		
Unspecified:[9]								
Reported	921	5,190	3	19	6	44	1,150	8,760
Estimated	4,900	47,000	610	4,600	45	470	430	2,300
Total	8,850	97,000	945	8,180	1,140	10,300	1,580	11,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4] Includes stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6] Includes agricultural limestone and poultry grit and mineral food.

[7] Includes lime manufacture.

[8] Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

[9] Reported and estimated production without a breakdown by end use.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,200	$81,400	$7.95
Plaster and gunite sands	46	323	7.02
Concrete products (blocks, bricks, pipe, decorative, etc.)	13	120	9.23
Asphaltic concrete aggregates and other bituminous mixtures	1,270	8,480	6.69
Road base and coverings[2]	6,060	38,700	6.38
Fill	5,380	22,900	4.25
Snow and ice control	323	2,210	6.83
Railroad ballast	96	751	7.82
Filtration	6	43	7.17
Other miscellaneous uses	201	1,700	8.45
Unspecified:[3]			
Reported	9,840	62,200	6.32
Estimated	14,900	95,900	6.43
Total or average	48,400	315,000	6.51

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes road and other stabilization (cement).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6

WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	9,270	74,600	882	6,190	143	1,000
Asphaltic concrete aggregates and other bituminous mixtures	802	6,180	372	1,640	W	W
Road base and coverings[3]	3,950	27,700	1,300	6,860	757	3,780
Fill	5,070	21,900	272	871	40	154
Snow and ice control	287	1,940	13	89	23	173
Railroad ballast	55	415	W	W	W	W
Other miscellaneous uses	176	1,500	33	300	122	825
Unspecified:[4]						
Reported	1,200	10,300	2,400	14,900	3,490	20,400
Estimated	13,600	87,400	504	3,240	811	5,230
Total	34,400	232,000	5,770	34,100	5,390	31,600

	Unspecified districts	
	Quantity	Value
Concrete aggregates and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base and coverings[3]	59	353
Fill	--	--
Snow and ice control	--	--
Railroad ballast	W	W
Other miscellaneous uses	11	102
Unspecified:[4]		
Reported	2,750	16,600
Estimated	--	--
Total	2,820	17,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

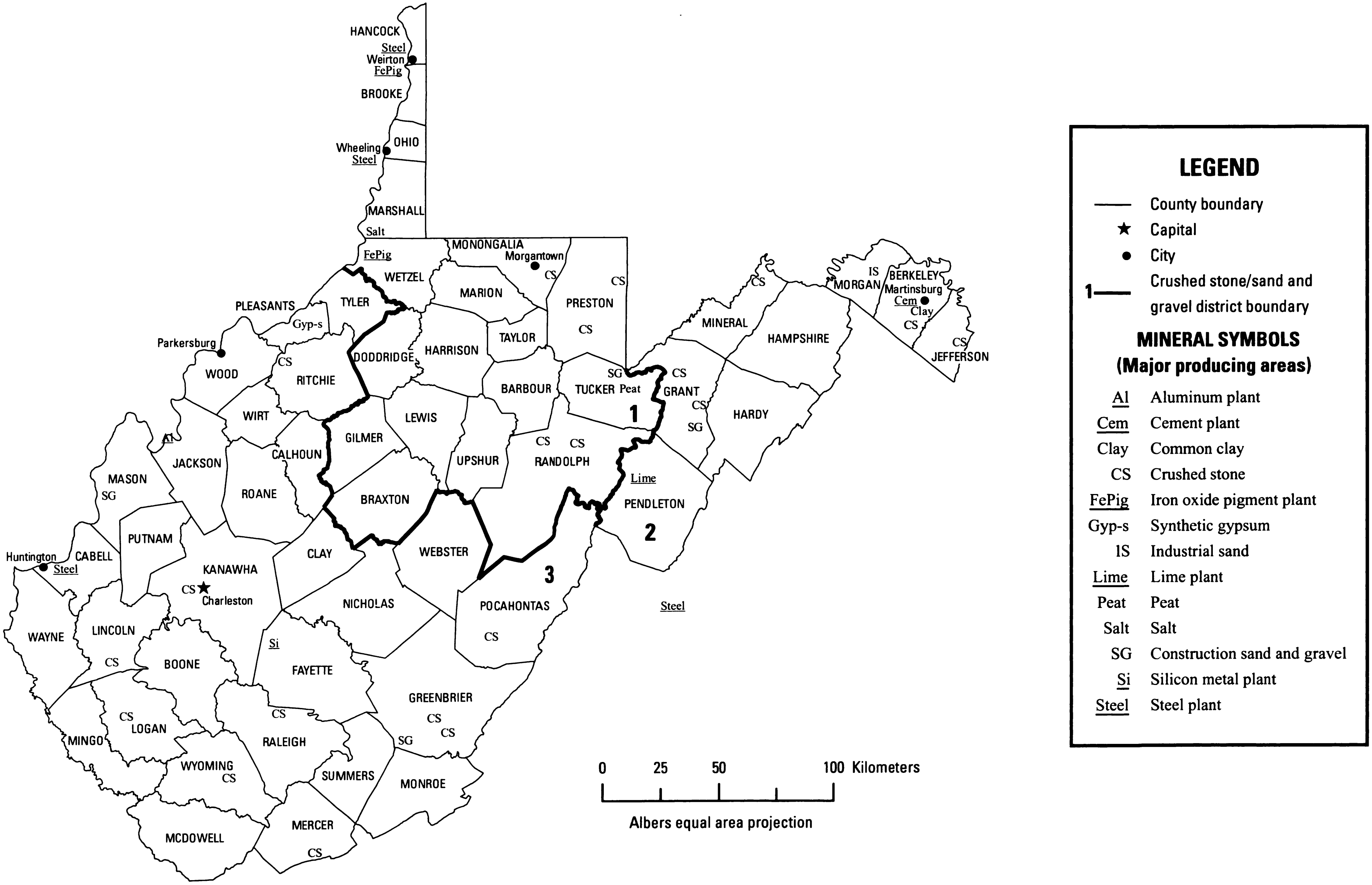
[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

[3] Includes road and other stabilization (cement).

[4] Reported and estimated production without a breakdown by end use.

WEST VIRGINIA



Source: West Virginia Geological and Economic Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF WEST VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the West Virginia Geological and Economic Survey for collecting information on all nonfuel minerals.

In 2006, West Virginia's nonfuel raw mineral production[1] was valued at $230 million, based upon annual U.S. Geological Survey (USGS) data. This was a 10%, or $21 million, increase from the State's total nonfuel mineral value of $209 million in 2005, which was a nearly 26%, or $43 million, increase from that of 2004.

In 2006, crushed stone continued to be West Virginia's leading nonfuel mineral commodity by value, accounting for 52% of the State's total nonfuel mineral production value. Cement (portland and masonry), lime, industrial sand and gravel, and construction sand and gravel followed (in descending order of value). These five mineral commodities accounted for 98% of the State's total value of nonfuel raw mineral production.

Crushed stone production was nearly the same in 2006 as in the previous year with the production of 14.5 million metric tons; nevertheless, the commodity's value increased by $12 million and led the State's increase in nonfuel mineral production value for the year. Portland cement and masonry cement combined followed, rising by about $11 million, as a result of increases in the production and unit value of portland cement, while small decreases took place in the same for masonry cement. Construction sand and gravel also showed increases in production and value; a 35% increase in production resulted in a 110%, or nearly $2 million, increase in its value (table 1). The largest decrease in value took place in salt, in which a relatively small drop in the commodity's production resulted in a decrease in value of approximately $4 million.

West Virginia continued to rank 10th among 15 producing States in the quantity of salt produced in the State and remained a significant producer of crushed stone. The State's mines produced industrial minerals and coal; no metals were mined in West Virginia. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. In 2006, West Virginia ranked 9th in the Nation (10th in 2005) in the production of primary aluminum among 11 producing States.

Industry Trends and Developments

According to the West Virginia Geological and Economic Survey, although aggregate, by far, was the largest use for the State's limestone resources, additionally, limestone was processed for use in the production of cement and in steel production and for such uses as agricultural lime and ballast, flue gas desulfurization, fluidized bed combustion, low silica rock dust for the coal industry, metallurgical flux, stream revitalization, various chemical applications, and wastewater treatment (Britton, Blake, and McColloch, 2007).

Commodity Review

Industrial Minerals

Stone, Crushed.—The majority of West Virginia's limestone production was from a northeast-southwest trend in the counties along the eastern border with Virginia. The trend extended northeastward into the State's eastern panhandle along outcrop belts of thick carbonate units of Ordovician, Silurian, Devonian and Mississippian age (spanning an age of from about 480 million years to about 320 million years). The county that produced the most limestone was Monongalia County, from which stone was quarried from the Greenbrier Limestone of Mississippian age. In the western portion of the State in Ritchie County (anomalous to the norm of the State's eastern production trend), an underground limestone mine opened in 2005, from which approximately 590,000 metric tons (t) of stone was extracted; interestingly, this source was also the Greenbrier Limestone. Another mine in Harrison County produced more than 75,000 t of stone (also in 2005) from the Upper Pennsylvania Monongahela Formation.

Owing to several major highway construction projects, the demand for limestone aggregate was expected to continue to increase. These projects included the Coalfields Expressway in southern West Virginia and the Corridor H project across the east-central mountain portion of the State. Additionally, a number of large construction projects and smaller road projects throughout the State were expected to continue to demand additional aggregate (Britton, Blake, and McColloch, 2007).

Reference Cited

Britton, J.Q., Blake, B.M., Jr., and McColloch, G.H., 2007, West Virginia, in annual review 2006: Mining Engineering, v. 59, no. 5, May, p. 123–125.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WEST VIRGINIA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	161	441	186	524	W	W
Gemstones, natural	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	524	2,500	318	1,630	429	3,470
Industrial	343	17,300	369	17,800	333	17,200
Stone, crushed	14,700	72,600	14,600 r	108,000 r	14,500	120,000
Combined values of cement, lime, peat, salt, stone (dimension sandstone), and value indicated by the symbol W	XX	73,500	XX	81,100	XX	89,100
Total	XX	166,000	XX	209,000 r	XX	230,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WEST VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	25 r	13,300 r	$98,600 r	23	13,700	$114,000
Sandstone	6	1,260	9,620	6	893	5,550
Total	XX	14,600 r	108,000 r	XX	14,500	120,000

rRevised. XX Not applicable.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	266	1,400
Filter stone	W	W
Other coarse aggregate	70	1,170
Total	620	4,530
Coarse aggregate, graded:		
Concrete aggregate, coarse	206	1,400
Bituminous aggregate, coarse	767	4,770
Bituminous surface-treatment aggregate	63	461
Railroad ballast	(2)	(2)
Other graded coarse aggregate	989	10,800
Total	2,030	17,500
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Stone sand, bituminous mix or seal	178	993
Screening, undesignated	210	1,580
Other fine aggregate	680	6,350
Total	1,070	8,920
Coarse and fine aggregate:		
Graded road base or subbase	1,340	7,290
Unpaved road surfacing	(4)	(4)
Crusher run or fill or waste	937	6,130
Other coarse and fine aggregates	1,060	9,490
Total	3,330	22,900
Other construction materials	727	6,040
Agricultural, limestone	(5)	(5)
Special, mine dusting or acid water treatment	(5)	(5)
Other miscellaneous uses, waste material	(5)	(5)
Unspecified:[6]		
Reported	4,460	39,500
Estimated	2,300	20,000
Total	6,740	60,000
Grand total	14,500	120,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company preprietary data; included with "Other graded coarse aggregates."

[3] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6] Reported and estimated production without a breakdown by end use.

TABLE 4

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	727	6,040	--	--	--	--
Agricultural[6]	W	W	--	--	W	W
Special[7]	--	--	W	W	--	--
Other miscellaneous uses[8]	--	--	--	--	W	W
Unspecified:[9]						
Reported	3,170	28,000	561	5,000	729	6,430
Estimated	--	--	1,700	15,000	590	5,300
Total	5,240	43,800	5,120	47,900	4,190	28,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5] Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

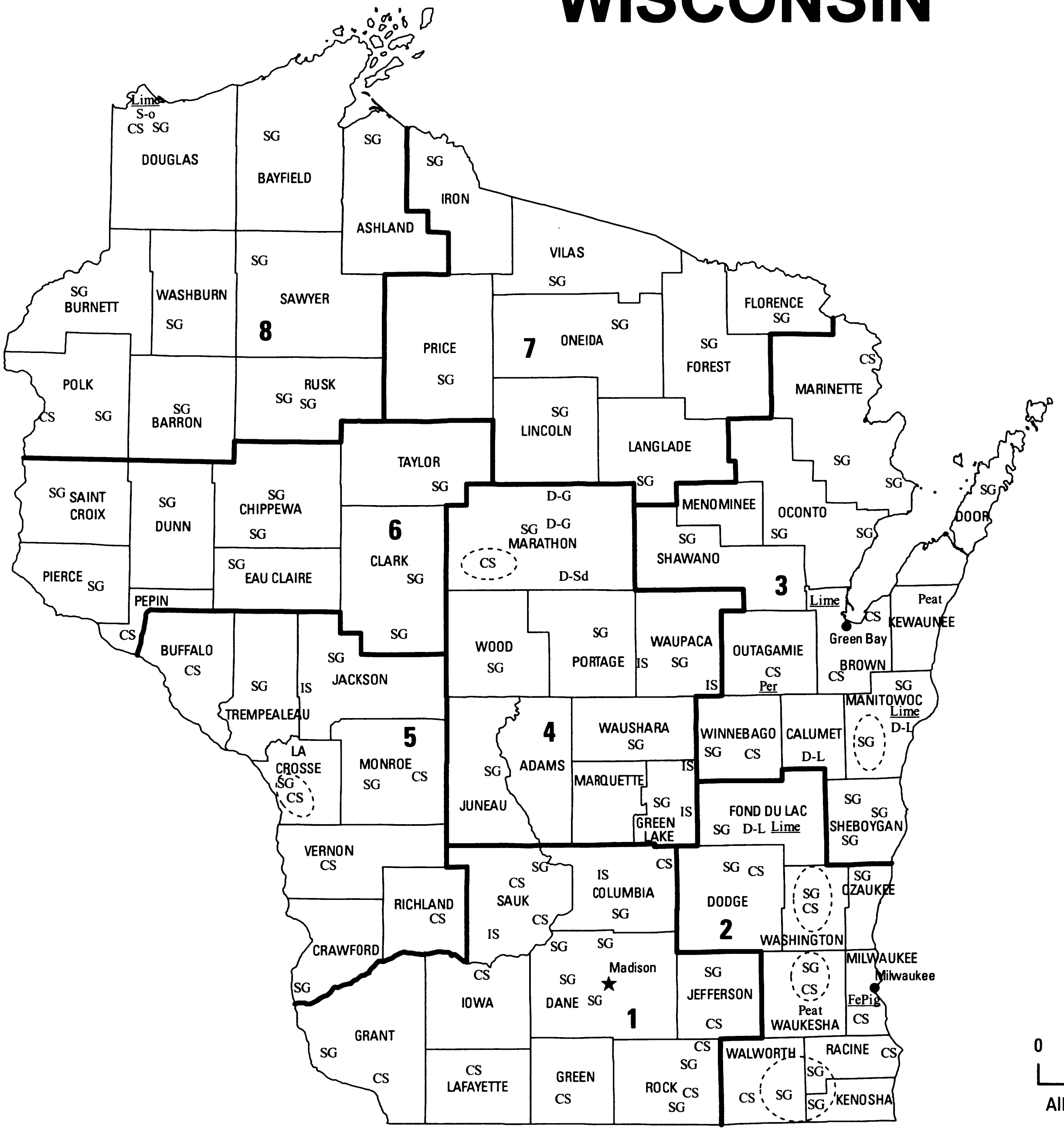
[6] Includes agricultural limestone.

[7] Includes mine dusting or acid water treatment.

[8] Includes waste material.

[9] Reported and estimated production without a breakdown by end use.

WISCONSIN



LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
CS	Crushed stone
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
FePig	Iron oxide pigment plant
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
⬭	Concentration of mineral operations

0 25 50 100 Kilometers

Albers equal area projection

Source: Wisconsin Geological and Natural History Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF WISCONSIN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2006, Wisconsin's nonfuel raw mineral production[1] was valued at $566 million, based upon annual U.S. Geological Survey (USGS) data. This was a marginal (less than 1%) decrease from the State's total nonfuel mineral value for 2005, following a 20%, or $95 million, increase from 2004 to 2005. The State remained 34th in rank among the 50 States in total nonfuel mineral production value and accounted for 1% of the U.S. total value. [Because data for peat and portland cement (2004–05) have been withheld (company proprietary data), the actual total values for 2004 through 2006 are somewhat higher than those reported in table 1.]

Crushed stone and construction sand and gravel were (in descending order of value) Wisconsin's leading nonfuel minerals in 2006 accounting for more than 36% and 32%, respectively, of the State's reportable total nonfuel raw mineral production value (table 1). These were followed by industrial sand and gravel, representing about 13% of the total value, lime with about 12.5%, and dimension stone with about 6% of the State's total nonfuel mineral value.

In 2006, significant increases took place in the values of industrial sand and gravel, lime, and dimension stone, up by more than $18 million, more than $9 million, and nearly $8 million, respectively. However, on balance, these increases were offset by decreases of $30 million in crushed stone value and $9 million in construction sand and gravel, resulting in the State's small decrease in total nonfuel mineral production value (table 1).

In 2006, Wisconsin continued to rank first in the Nation in the quantities of dimension stone produced, third in industrial sand and gravel production, and Wisconsin was a significant producer of crushed stone. Although lime production increased by 4%, the State decreased in rank to 9th from 8th, and in construction sand and gravel an 8% decrease in production resulted in a decrease in rank to 11th from 10th.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey[2] (WGNHS). Although a small decrease took place in aggregate production, Wisconsin's nonfuel mineral industry remained active, particularly in the mineral commodities of industrial sand and dimension stone (sandstone and granite) (table 1). Other industrial minerals included agricultural lime produced as a primary product or a byproduct of aggregate crushing, dolomitic quicklime and hydrated lime products, landscape materials, roofing granules, and specialty aggregates. Also the State had a small peat industry and some limited clay production for landfill liners and construction use.

Exploration Activities, Discoveries, and Mine Development

In 2006, a continued consideration in aggregate exploration in and around major urban areas such as southeast Wisconsin has been whether permits and zoning can be obtained before development makes mining an impractical land use. Producers of dimension limestone, sandstone, and landscape stone products have followed the lead of the aggregate industry in seeking new reserves in less developed regions where permitting is easier. Industrial sand producers were active in expanding operations and seeking new reserves in anticipation of demand from the drilling and glass industries. There were no active metal mines in Wisconsin partly owing to recent rising metal prices, a renewed interest took place in the historic Penokee-Gogebic Range as a future iron resource.

Commodity Review

Industrial Minerals

Sand and Gravel, Industrial.—Wisconsin's industrial sand industry continued to increase in 2006, fueled by increasing demand for hydrofrac sand for the petroleum industry, increasing needs of the local glass industry, and a strong demand for foundry sand. Proposals for two new silica sand mines were submitted to Dunn County in western Wisconsin in 2006. The larger of the two planned mines, which would produce sand for glass and hydrofracturing, had advanced to the permitting process in early 2007. Plans were initiated to reopen an abandoned underground sand mine in Pierce County, located near Wisconsin's only other underground mine, which also produces industrial sand.

Stone, Crushed.—Wisconsin's aggregate industry is dominated by crushed limestone (and smaller quantities of crushed dolomite) and sand and gravel, but production of various Precambrian crystalline rock continued to increase. Much of the State's diabase, granite, quartzite, and traprock, that was quarried was used in railroad ballast, but an increasing share was being used for asphalt and concrete in applications where high durability was required. Other hardrock products included manufactured sand and specialty aggregates for architectural and landscape uses.

Stone, Dimension.—In 2006, Wisconsin continued to be a national leader in dimension stone production. A good economy and strong demand from the building industry resulted in several producers expanding capacity and product lines in 2006. The dominant share of dimension stone production and value was from the Silurian age dolomites of eastern Wisconsin. Products included landscape stone, pavers, riprap, structural stone, and a variety of cut and finished facing and veneer stone. Dimension limestone production also is concentrated in the Silurian age rocks of eastern Wisconsin, centered on the Byron area of Fond du Lac County, the Chilton area of Calumet County, and the Sussex-Lannon area of Waukesha County. Products included paving and flagstone, riprap, a variety of cut and finished building stones, landscape stone materials, and veneer stone colors and styles. Strong demand for upscale housing has resulted in several producers planning to expand and modernize veneer and paving stone plants.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Bruce A. Brown, Senior Geologist, Wisconsin Geological and Natural History Survey, authored the text of the State mineral industry information provided by that agency.

A similar range of building and landscape materials was produced from silica-cemented sandstone beds in the Cambrian-age rocks of central Wisconsin. The demand for landscape stone has resulted in local quarries, including some aggregate operations, producing rough dimension stone from the Ordovician age Prairie du Chien and Galena-Platteville limestones.

Many sand and gravel producers saved and sold large boulders for landscaping use. Stones for use in landscaping, including glacial boulders, grus (disaggregated weathered granite), washed gravel, and weathered limestone blocks have become an increasingly lucrative sideline for many aggregate and stone producers. Precambrian-age hardrock (granite, traprock, quartzite) material is increasingly in demand for aggregates requiring high durability such as seal coat chips, breakwater stone, railroad ballast, riprap, roofing granules, and specialty aggregate for terrazzo and exposed aggregate structural panels.

Environmental Issues and Reclamation

No metallic mining has taken place in Wisconsin since the closing of the Flambeau copper mine 10 years ago. The Flambeau Mining Co. (a subsidiary of Kennecott Minerals Co.) asked the State to declare restoration of the site as successfully completed. That status would allow the company to reduce its reclamation bonding significantly, although the company would still be obligated to maintain a reduced bond for 20 years and continue to monitor ground water and surface water for 40 years. No active exploration for metals took place in Wisconsin during 2006.

Legislation and Government Programs and Outreach Activities

Legislative and regulatory action viewed with concern by the aggregate industry included diversion of money from the State's Transportation Fund and repeal of gasoline tax indexing. On the positive side, progress was made in streamlining the process for obtaining air quality and general operating permits for portable crushing plants, and nonmetallic mine reclamation rules were revised and updated.

The WGNHS, in cooperation with Wisconsin Department of Transportation, began work on a statewide GIS mapping and data project of aggregate production sites that will include geology and test data.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN WISCONSIN[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004		2005		2006	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	W	(3)	W	(3)	--	--
Gemstones, natural	NA	6	NA	6	NA	6
Lime	850	53,900	888	61,300	922	70,700
Peat	W	(3)	W	(3)	W	(3)
Sand and gravel:						
Construction	43,400	178,000	43,200	191,000	39,600	182,000
Industrial	2,140	47,000	2,250	55,700	2,450	74,100
Stone:						
Crushed	39,300	172,000	39,800[r]	234,000[r]	35,800	204,000
Dimension	232	23,800	278	27,600	297	35,400
Total	XX	475,000	XX	570,000[r]	XX	566,000

[r] Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Value excluded to avoid disclosing company proprietary data.

TABLE 2
WISCONSIN: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2005			2006		
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	199	32,400 [r]	$193,000 [r]	188	29,000	$166,000
Dolomite	9	1,000	4,920	9	781	3,800
Marble	--	--	--	1	59	340
Granite	5	2,740	15,800	5	2,630	14,800
Sandstone and quartzite	3	1,580	9,920	3	1,660	8,740
Traprock	4	2,120 [r]	10,900 [r]	4	1,690	10,100
Total	XX	39,800 [r]	234,000 [r]	XX	35,800	204,000

[r] Revised. XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

TABLE 3

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	98	1,570
Filter stone	118	557
Other coarse aggregate	819	5,420
Total	1,040	7,550
Coarse aggregate, graded:		
Concrete aggregate, coarse	371	2,340
Bituminous aggregate, coarse	59	258
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	940	7,260
Total	2,070	12,800
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	633	3,050
Other fine aggregate	283	1,060
Total	941	4,230
Coarse and fine aggregates:		
Graded road base or subbase	2,890	13,800
Unpaved road surfacing	(2)	(2)
Crusher run or fill or waste	776	5,340
Roofing granules	(2)	(2)
Other coarse and fine aggregates	2,280	11,900
Total	6,470	34,500
Other construction materials	5	25
Agricultural:		
Limestone	218	2,590
Other agricultural uses	16	62
Total	234	2,650
Chemical and metallurgical, lime manufacture	(3)	(3)
Other miscellaneous uses, refractory stone	(3)	(3)
Unspecified:[4]		
Reported	902	5,170
Estimated	24,000	140,000
Total	24,800	141,000
Grand total	35,800	204,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included in "Total."

[3] Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4] Reported and estimated production without a breakdown by end use.

TABLE 4

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2[3]		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[4]	650	5,800	W	W	--	--	--	--
Coarse aggregate, graded[5]	1,720	11,100	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[6]	W	W	W	W	--	--	--	--
Coarse and fine aggregate[7]	4,450	23,900	1,280	7,050	(8)	(8)	--	--
Other construction materials	5	25	--	--	--	--	--	--
Agricultural[9]	W	W	W	W	--	--	--	--
Chemical and metallurgical[10]	--	--	W	W	--	--	--	--
Other miscellaneous uses[11]	--	--	W	W	--	--	--	--
Unspecified:[12]								
Reported	--	--	--	--	1,140	6,250	--	--
Estimated	8,000	45,000	3,300	19,000	2,100	12,000	6,900	40,000
Total	15,400	89,600	5,890	32,200	3,230	18,300	6,900	40,000

	Districts 6 and 8[3]		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[4]	W	W	70	311
Coarse aggregate, graded[5]	W	W	--	--
Fine aggregate (-⅜ inch)[6]	--	--	87	450
Coarse and fine aggregate[7]	241	1,330	263	1,160
Other construction materials	--	--	--	--
Agricultural[9]	--	--	--	--
Chemical and metallurgical[10]	--	--	--	--
Other miscellaneous uses[11]	--	--	--	--
Unspecified:[12]				
Reported	--	--	--	--
Estimated	3,600	21,000	--	--
Total	3,930	22,300	420	1,920

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1] No production for District 7.

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

[3] Districts 1 and 2 and 6 and 8 are combined to avoid disclosing company proprietary data.

[4] Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[5] Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[6] Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[7] Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[8] Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[9] Includes agricultural limestone and other agricultural uses.

[10] Includes lime manufacture.

[11] Includes refractory stone.

[12] Reported and estimated production without a breakdown by end use.

TABLE 5
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,670	$26,600	$4.70
Plaster and gunite sands	10	101	10.10
Concrete products (blocks, bricks, pipe, decorative, etc.)	215	1,030	4.80
Asphaltic concrete aggregates and other bituminous mixtures	1,480	7,110	4.81
Road base and coverings[2]	6,200	26,300	4.23
Fill	1,450	4,880	3.37
Snow and ice control	176	1,050	5.94
Roofing granules	10	60	6.00
Filtration	62	310	5.00
Other miscellaneous uses	165	1,160	7.05
Unspecified:[3]			
Reported	1,210	6,050	5.01
Estimated	23,000	107,000	4.68
Total or average	39,600	182,000	4.60

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Includes road and other stabilization (lime).

[3] Reported and estimated production without a breakdown by end use.

TABLE 6
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	864	4,880	1,860	8,430	1,380	6,470
Asphaltic concrete aggregates and road base materials[3]	340	1,510	W	W	1,280	4,570
Fill	68	254	860	3,240	249	604
Snow and ice control	--	--	W	W	W	W
Other miscellaneous uses[4]	71	370	2,530	12,600	149	740
Unspecified:[5]						
Reported	148	972	38	294	102	529
Estimated	1,250	5,960	9,640	48,100	2,560	11,500
Total	2,740	13,900	14,900	72,600	5,720	24,400
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	545	1,550	(6)	(6)	W	W
Asphaltic concrete aggregates and road base materials[3]	280	1,130	(6)	(6)	W	W
Fill	50	213	(6)	(6)	96	172
Snow and ice control	--	--	(6)	(6)	W	W
Other miscellaneous uses[4]	10	54	--	--	832	5,100
Unspecified:[5]						
Reported	817	3,600	--	--	43	505
Estimated	3,020	13,400	2,170	9,560	1,780	7,840
Total	4,720	19,900	2,640	12,300	2,750	13,600
	District 7		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	24	122	407	1,890	W	W
Asphaltic concrete aggregates and road base materials[3]	282	1,060	1,460	5,660	W	W
Fill	W	W	W	W	--	--
Snow and ice control	W	W	W	W	5	24
Other miscellaneous uses[4]	W	W	98	440	W	W
Unspecified:[5]						
Reported	11	50	49	95	--	--
Estimated	1,570	6,920	626	2,580	362	1,590
Total	1,970	8,760	2,640	10,700	1,500	5,840

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes plaster and gunite sands.

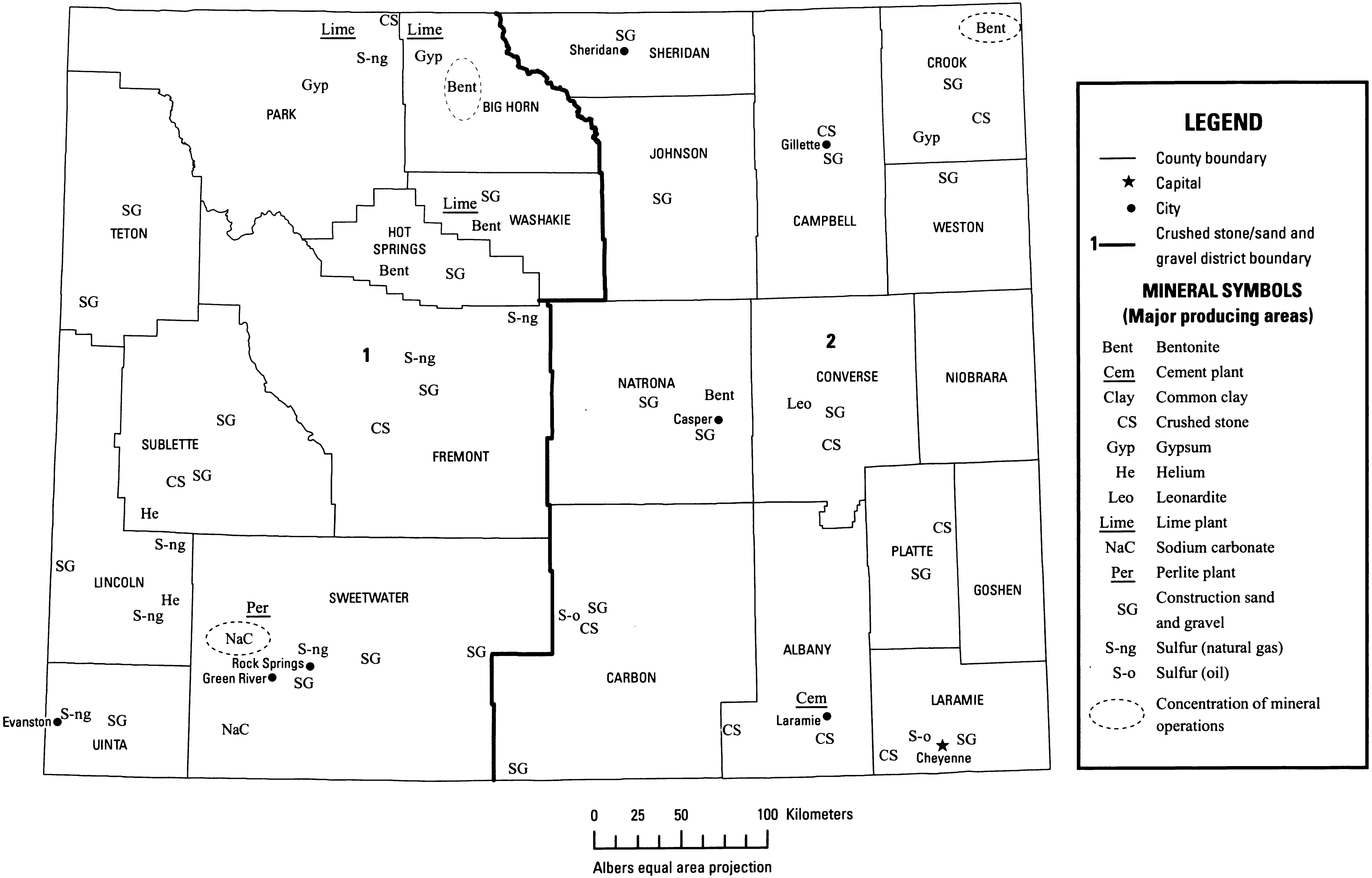
[3] Includes road and other stabilization (lime).

[4] Includes filtration and roofing granules.

[5] Reported and estimated production without a breakdown by end use.

[6] Withheld to avoid disclosing company proprietary data; included in "Total."

WYOMING



Source: Wyoming State Geological Survey/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wyoming State Geological Survey for collecting information on all nonfuel minerals.

In 2006, Wyoming's nonfuel raw mineral production was valued[1] at $1.59 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $290 million, or a more than 22%, increase from the State's total nonfuel mineral production value for 2005, which then was up $250 million (up nearly 24%) from that of 2004. The State continued to rank 14th among the 50 States in total nonfuel raw mineral production value and accounted for about 2.4% of the U.S. total value. Yet, per capita, the State ranked second (first in 2004) in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 515,000, the value of production was about $3,090 per capita.

Soda ash was Wyoming's leading nonfuel mineral, by value, followed by bentonite, Grade-A helium, construction sand and gravel, and crushed stone. Together, the five accounted for slightly more than 95% of the State's total nonfuel raw mineral production value. In 2006, nearly all the State's nonfuel mineral commodities production showed increases in value, with gemstones and zeolites value remaining the same as in 2005. The largest increases in value took place in production of bentonite clay, construction sand and gravel, crushed stone, grade-A helium, portland cement, and soda ash. A relatively small increase in soda ash production led to a more than $160 million rise in its value. In descending order of change, the value of crushed stone rose by $31.5 million; construction sand and gravel value rose by about $22 million; bentonite by $19 million; and portland cement by more than $10 million. The unit values of each also increased, except for those of the two aggregate commodities, which were down, slightly (table 1). Although a smaller increase of less than $5 million took place in the value of crude gypsum, its unit value rose the most of all of the State's mineral commodities; a small increase in production resulted in a near doubling of its value from 2005 to 2006. (A substantial increase also took place in the value of grade-A helium—increase in value withheld, company proprietary data.)

In 2006, Wyoming continued to be first in rank in the quantities of soda ash and bentonite clay produced, and second in Grade-A helium production. Wyoming also continued to be a producer of significant quantities of construction sand and gravel and gypsum. The United States is the world's second leading producer of soda ash, which is produced mainly from trona ore. Wyoming was one of only two soda ash-producing States and is home to the world's largest known deposit of trona. Soda ash (sodium carbonate) is an inorganic chemical that is used extensively in the manufacture of glass, paper, soap and detergents, and textiles, and, in the form of sodium bicarbonate, in food products. California produced a significantly smaller quantity of natural soda ash.

The Wyoming State Geological Survey[2] (WSGS) provided the following narrative information. Production data in the text that follows are reported by the WSGS and are based on the agency's own surveys and estimates. They may differ from production figures reported to the USGS.

Exploration and Development Activities

Industrial Minerals

Diamond.—Significant increases in the price of uncut diamond in recent years, combined with the desire to locate domestic sources of diamond, attracted minor exploration interest within the State during the year. Individuals and small companies directed their exploration activities toward several locations, including the Bighorn Basin, the Cedar Mountain area, the Eagle Rock area, the Iron Mountain District, the Leucite Hills, the southern Medicine Bow Mountains, the Seminoe Mountains, the west side of the Sierra Madre mountain range, and the Wyoming-Colorado State Line District.

Gemstones.—The Cedar Rim area remained the principal focus of opal prospecting and accompanying efforts to market the State's opal resource. Prospecting for opals also extended to other locations within the State, including the Absaroka Mountains volcanic sediments, the Arikaree Formation, and related units in the Saratoga Valley and eastern Wyoming, and the Tertiary White River Formation.

Iolite, kyanite, and ruby gemstones remained the object of prospecting in the Palmer Canyon and Grizzley Creek areas of the Laramie Mountains. Prospecting was also carried out for ruby and sapphire in the Granite Mountains and the southern Wind River Mountains. General interest continued to increase for all types of gemstone resources throughout the State.

In other prospecting activity, a black tourmaline crystal, 5 centimeters (cm) long, was recovered from a pegmatite float in the Lake Owen area of the Medicine Bow Mountains. A beryl crystal, 7 cm across, was recovered from pegmatite in the Copper Mountain area of the Owl Creek Mountains, and a lavender lepidolitic quartzite float associated with conglomerate was observed in the vicinity of Beaver Rim.

Renewed interest in jade took place during the year. This was accompanied by minor prospecting in the Granite Mountains.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2] Wayne M. Sutherland, Geologist (gemstones, metals and economic geology), and Robert Gregory, Geologist (uranium, minerals, and in situ mining) of the Wyoming State Geological Survey, coauthored the text of the State mineral industry information.

Metals

Production of metals during 2006 was limited to small-scale placer gold recovery and amateur prospecting. However, rapidly increasing prices of precious and base metals spurred increased interest in copper, gold, platinum, and other metals. Gold prices ended the year nearly 70% above the 2003 level, while copper prices ended the year two-and one-half times higher than the 2003 level. Prices of other metals also remained strong through 2006. Recent discoveries of major gold deposits in Canada and the Great Lakes region in terrains similar to those in Wyoming attracted several exploration companies to the State.

Prospectors targeted titaniferous magnetite in the Strong Creek area of the Laramie Mountains and titaniferous sands of the Mesa Verde Formation in the Bighorn Basin. One company interested in iron investigated the possibility of reopening the Atlantic City iron mine. Other targeted metals included chromium, copper, and nickel in the Medicine Bow Mountains, the Sierra Madre, and the Silver Crown area of the Laramie Mountains.

The Bear Lodge Mountains was the site of exploration and drilling for gold and rare-earth elements during the year. Exploratory drilling for gold also was carried out in the Rattlesnake Hills in central Wyoming, where exploration during the 1980s identified at least one significant deposit hosting an estimated 31,000 kilograms (1 million troy ounces) of gold. Several companies also focused on large paleoplacers in the South Pass area, and on gold in the historic gold districts of Atlantic City, Lewiston, and Miners Delight.

Exploration for platinum-group metals took place primarily in the Lake Owen area of the Medicine Bow Mountains in southeast Wyoming. Other investigations targeted the Sierra Madre in south-central Wyoming and platinum-hosting black shales in western Wyoming.

Commodity Review

Industrial Minerals

Bentonite.—Mine production increased by about 17% in 2006, resulting in an increase of 6.4% in refined bentonite production compared with that of 2005. Eleven mines in five counties supplied bentonite to 13 mills for processing into refined bentonite. Employment in the State's bentonite industry totaled about 800 in 2006.

Gypsum.—Production of gypsum totaled slightly more than 390,000 metric tons (t) in 2006, a decrease of about 34% compared with that of 2005. Gypsum was produced from three quarries in Big Horn, Park, and Crook Counties (in order of decreasing total production). Eighteen people were employed in this sector in 2006. An additional quarry in Albany County that was idle during 2006 produces gypsum as needed for use as a settling retardant in cement.

Limestone.—Production of limestone continued at 13 quarries in six counties during the year. About 1.73 million metric tons (Mt) was produced in the form of crushed stone for use mainly in highway construction. A total of 596,000 t of chemical-grade limestone also was produced for use in cement manufacturing, sugar beet refining, and other industrial processes. Employment in the limestone industry totaled 114, which included those employed in the siliceous shale and chemical limestone operations.

Soda Ash and other Sodium Compounds.—In 2006, five underground mines in Sweetwater County, produced a total of 16.4 Mt of trona, a naturally occurring sodium sesquicarbonate, from which approximately 10 Mt of soda ash (anhydrous sodium carbonate) was produced. Trona production was slightly higher than in 2005, consistent with the historical growth pattern of 1% to 2% per year. The Green River Basin in southwest Wyoming is host to the largest trona deposits in the world with reserves of slightly more than 115 billion metric tons (Leigh, 1998). Soda ash is used in the manufacture of glass and chemicals, soaps, detergents, pulp and paper, and as a chemical agent in flue gas desulfurization, and water treatment (Kostick, 2008). A total of 2,259 people were employed in the trona and soda ash industries during the year.

Other Industrial Minerals.—Black Hills Bentonite LLC continued production of leonardite from its quarry near Glenrock, Converse County. Production in 2006 was 52,600 t, up 11.4% compared with that of 2005. Leondardite is a soft, earthy, coal-like material that is used as a thinner in oil drilling mud and as an ingredient in fertilizer. Black Hills employed 14 people to conduct its leonardite operations. In other industrial minerals activity, two quarries in Albany County produced a total of 159,000 t of siliceous shale, up 39.6% compared with that of 2005. This shale is used as an additive in cement. Gemstone production during the year was limited to small-scale, amateur activity.

For additional information on these minerals, including recent publications, and further information on the geology of Wyoming, visit the Wyoming State Geological Survey Web site at http://www.wsgs.uwyo.edu/.

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Leigh, R.T., 1998, Wyoming trona—An overview of the geology, *in* Dyni, J.R., and Jones, R.W., eds., Proceedings of the First International Soda Ash Conference, Volume II, Rock Springs, WY, June 10–12, 1997: Laramie, WY, Wyoming State Geological Survey Public Information Circular No. 40, p. 1–14.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,510	151,000	4,160	190,000	4,360	209,000
Common	49	107	53	128	53	206
Gemstones, natural	NA	13	NA	14	NA	14
Sand and gravel, construction	10,200	40,100	11,700	52,400	17,200	74,600
Stone, crushed	6,300	35,300	6,990 ^{r}	39,800 ^{r}	12,600	71,300
Combined values of cement (portland), gypsum (crude), helium (Grade–A), lime, soda ash, zeolites	XX	819,000	XX	1,010,000	XX	1,240,000
Total	XX	1,050,000	XX	1,300,000	XX	1,590,000

^{r}Revised. NA Not available. XX Not applicable.

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2] Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	13 ^{r}	1,860 ^{r}	$9,210 ^{r}	20	3,500	$19,900
Granite	1	W	W	1	W	W
Quartzite	1	9	44	1	(3)	1
Marble	1	W	W	--	--	--
Traprock	-- ^{r}	--	--	8	W	W
Volcanic cinder and scoria	5 ^{r}	1,370 ^{r}	6,580 ^{r}	9	4,470	25,400
Miscellaneous stone	1	1,560	8,240	3	2,180	12,400
Total	XX	6,990 ^{r}	39,800 ^{r}	XX	12,600	71,300

^{r}Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes limestone-dolomite reported with no distinction between the two.

[3] Less than ½ unit.

TABLE 3
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse and fine aggregates, graded road base or subbase	W	W
Chemical and metallurgical, cement manufacture	W	W
Unspecified:[2]		
Reported	11,700	67,200
Estimated	920	5,200
Total	12,600	72,400
Grand total	12,600	71,300

W Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 4
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse and fine aggregate[2]	--	--	--	--	W	W
Chemical and metallurgical[3]	--	--	W	W	--	--
Unspecified:[4]						
Reported	212	1,210	9,110	51,700	2,350	13,100
Estimated	65	370	850	4,900	--	--
Total	277	1,580	9,970	56,600	2,350	13,100

W Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported." -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes graded road base or subbase.

[3] Includes cement manufacture.

[4] Reported and estimated production without a breakdown by end use.

TABLE 5
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	470	$4,190	$8.91
Asphaltic concrete aggregates and other bituminous mixtures	485	4,500	9.28
Road base and coverings	3,690	15,700	4.25
Fill	191	1,490	7.80
Other miscellaneous uses	5	69	13.80
Unspecified:[2]			
Reported	10,500	38,600	3.68
Estimated	1,830	10,100	5.51
Total or average	17,200	74,600	4.35

[1] Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

TABLE 6
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	379	3,590	91	602	--	--
Asphaltic concrete aggregates and road base materials	2,190	11,300	1,570	5,670	411	3,190
Fill	138	1,200	53	289	--	--
Other miscellaneous uses	5	66	1	3	--	--
Unspecified:[2]						
Reported	3,350	11,300	2,600	13,900	4,540	13,400
Estimated	597	3,290	789	4,350	443	2,440
Total or average	6,660	30,800	5,110	24,800	5,400	19,100

-- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Reported and estimated production without a breakdown by end use.

MAP MINERAL SYMBOLS[1]

Abr	Abrasives
Abr	Abrasives plant
Ag	Silver
AgLime	Agricultural lime
Al	Aluminum plant
Au	Gold
B	Borates
BC	Ball clay
Ba	Barite
Ba	Barite plant
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Bent	Bentonite plant
Br	Bromine
Bx	Bauxite
CS	Crushed stone
CaC	Calcium carbonate
Cd	Cadmium
Cem	Cement plant
Clay	Common clay
Cu	Copper
Cu	Copper plant
D-D	Dimension dolomite
D-G	Dimension granite
D-Gn	Diamond gneiss
D-L	Dimension limestone
D-M	Dimension marble
D-Q	Dimension quartzite
D-Sd	Dimension sandstone
D-Sl	Dimension slate
D-Sp	Dimension soapstone
DS	Dimension stone
DS	Dimension stone plant
Dia	Diatomite
Dia	Diatomite plant
Diam	Diamond
Do	Dolomite
FA	Ferroalloys plant
FC	Fire clay
Fe	Iron
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Fel	Feldspar
Ful	Fuller's earth
GS	Greensand
Gar	Garnet
Gem	Gemstones
Gil	Gilsonite
Gr	Graphite plant
Gr-s	Synthetic graphite plant
Gyp	Gypsum
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
He	Helium
I	Iodine
ISG	Industrial sand and gravel
IS	Industrial sand
Jd	Jade
K	Potash
Ka	Kaolin
Ky	Kyanite
Leo	Leonardite
Li	Lithium carbonate
Li	Lithium plant
Lime	Lime plant
MgCp	Magnesium compounds
Mg	Magnesium metal plant
Mica	Mica
Mica	Mica plant
Mn	Manganese dioxide plant
Mo	Molybdenum
Mo	Molybdenum plant
Mul	Synthetic mullite plant
NS	Nepheline syenite
NaC	Sodium carbonate
NaS	Sodium sulfate
Nabic	Sodium bicarbonate
Nb/Ta	Niobium (columbium) and tantalum plant
O	Olivine
Opal	Precious opal
P	Phosphate rock
Pb	Lead
Pb	Lead plant
Pd	Palladium
Peat	Peat
Per	Perlite
Per	Perlite plant
Pt	Platinum
Pum	Pumice and pumicite
Pyrp	Pyrophyllite
RE	Rare earths plants
RW	Rock wool
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SA	Soda ash
SG	Construction sand and gravel
SaCp	Saline compounds
Salt	Salt
Sh	Shale
Shell	Shell
Si	Silicon metal plant
Slag	Slag
Steel	Steel plant
Talc	Talc
TiMet	Titanium metal plant
TiPig	Titanium dioxide pigment plant
Ti	Titanium minerals
Trip	Tripoli
V	Vanadium
V	Vanadium plant
Vm	Vermiculite

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[1] The maps in this report are intended to show by mineral symbols the location of significant nonfuel mineral mining or processing operations within each State in 2006. (An underlined symbol indicates a plant.) The symbols are not intended to show the location of every mine, quarry, and operation. Because there are about 13,000 nonfuel mineral operations in the United States, publication space limitations preclude the inclusion of a clear and legible map indicating all active operations. The U.S. Geological Survey's National Atlas, however, provides such data on the Internet at http://www.nationalatlas.gov. In most cases, a mineral symbol represents production of a significant quantity of a mineral. A symbol can indicate the location of a major mineral mining or processing operation, the location of a concentration of mining operations for a specific mineral, or the location of significant operations within a county. In some cases, however, a symbol may indicate a small operation that is significant because the mineral is uncommon or unique within the State or the Nation. Where there is an extensive geographic area with a significant concentration of similar operations, a dashed line defines the area.

Vm	Vermiculite plant	Zn	Zinc
Volc	Volcanic cinder	Zr	Zirconium
Wol	Wollastonite	Zr	Zirconium plant
Zeo	Zeolites		

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